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JOURNAL

OF

THE FRANKLIN INSTITUTE,

OF THE

State of Pennsylvania,

FOR THE

PROMOTION OF THE MECHANIC ARTS.

DEVOTED TO

MECHANICAL AND PHYSICAL SCIENCE, CIVIL ENGINEERING, THE ARTS
AND MANUFACTURES, AND THE RECORDING OF AMERICAN
AND OTHER PATENTED INVENTIONS.

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THIRD SERIES.
VOL. XVIII.
WHOLE NO. VOL. XLVIII.

PHILADELPHIA:
PUBLISHED BY THE FRANKLIN INSTITUTE, AT THEIR HALL.

1849

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JOURNAL

OF

THE FRANKLIN INSTITUTE

OF THE STATE OF PENNSYLVANIA

FOR THE

PROMOTION OF THE MECHANIC ARTS.

JULY, 1849.

CIVIL ENGINEERING.

Contributions to Railway Statistics, in 1846, 1847, *and* 1848. *By* Hyde Clarke, Esq.

No. 1.—Passengers and Fares. Having published an analysis of the railway returns for 1845, I have taken the earliest opportunity after the appearance of those of 1846 and 1847, of giving a similar analysis of them, under the same title of "Contributions to Railway Statistics," which I hope may prove equally acceptable to practical men as the former series.

The following are the totals of each class of passengers in the years ending 30th June.

	1844.	1845.	1846.	1847.
1st class,	4,875,332½	5,474,163	6,160,354½	6,572,714
2nd class,	12,235,686	14,325,825	16,931,065¾	18,699,288½
3rd class,	8,583,085½	13,135,820	18,506,527½	22,850,803½
Mixed,	2,069,498½	855,445¾	2,193,126	3,229,357
Altogether,	27,763,602½	33,791,253½	43,790,983¾	51,352,163

The amount received for each class, in each year, was as follows:

	1844.	1845.	1846.	1847.
1st class,	£1,432,688	£1,516,805	£1,661,898	£1,675,759
2nd class,	1,375,679	1,598,115	1,937,946	2,048,080
3rd class,	483,069	651,903	1,032,206	1,286,710
Mixed,	147,858	209,518	93,164	146,733
Altogether,	£3,439,294	£3,976,341	£4,725,215	£5,148,002

The yearly increase in numbers on each class of passengers, is as follows:

	1845.	1846.	1847.
1st class,	12 per cent.	12 per cent.	7 per cent.
2d class,	17 "	18 "	10 "
3rd class,	50 "	41 "	23 "
Altogether,	21 "	24 "	17 "

The yearly increase in money on each class of passengers, is as follows:

	1845.	1846.	1847.
1st class,	6 per cent.	9 per cent.	— per cent.
2d class,	16 "	21 "	6 "
3rd class,	34 "	58 "	24 "
Altogether,	16 "	18 "	9 "

It is to be observed that no deductions can be drawn from these figures, as the Railway Department returns are defective and informal.

The gross returns in each year from passengers, goods, &c., were as follows:

1842–3, -	£4,535,189
1843–4, - -	5,074,674
1844–5, -	6,209,714
1845–6, - -	7,565,569
1846–7, -	8,510,886

The capital expended on railways has been likewise given by Mr. Hackett, from which we can learn the amount expended in each year.

1842,	£52,380,100	whole capital,	——	expended.
1843,	57,635,100	"	£5,255,000	"
1844,	63,489,100	"	6,844,000	"
1845,	71,646,100	"	8,157,000	"
1846,	83,165,100	"	12,519,000	"
1847,	109,528,800	"	26,363,700	"

The total amount of railway expenditure from 1842 to the end of 1847, was £57,548,700.

The total amount of railway income in those years, has been:

1842, - -	£4,341,781
1843, - -	4,827,655
1844, - -	5,584,982
1845, - -	6,649,224
1846, - -	7,664,874
1847, - -	8,949,681
Add from railway returns, -	865,984
Altogether, - -	£38,884,181

Of course the whole of this income cannot be treated as real capital, no more can the whole of the expenditure; but it is a significant fact, that while the whole expenditure has been £57,548,700, the whole income has been £38,884,181, or more than two-thirds of that amount. This is deserving the attention of those who direct their attention towards the subject of railway capital.

In "Irish Wants and Practical Remedies," by Humphrey Brown, Esq.,

M. P., (p. 63,) is given a table of the estimated passenger and goods traffic of several English lines, as given before the House of Commons. This I have extended. The results are as follows:

	Passengers.	Goods. Tons.
Estimated traffic on 851 miles,	4,135,836	1,038,504
Realised traffic, 1845,	10,868,503	2,751,180
Excess over estimates,	6,732,667	1,712,676
Increase per cent.	160	170

In Mr. Brown's book on a length of 702 miles, the same increase of per centage is shown, namely, 160 per cent. on passengers, and 170 on goods.

The whole traffic in 1845 was 33,791,253½ passengers, and of goods, &c., 11,600,000 tons. Supposing the proportions to be the same, the number of passengers carried in 1845 more than was provided with means of conveyance before the existence of railways, was 20,800,000, and the number of tons of goods conveyed was 7,200,000. Thus the railways not only accommodated the full number of passengers for whom conveyances already existed, but carried the above enormous number in addition, besides a great quantity of goods. It will be found that this calculation is, however, far from representing the amount of accommodation now afforded.

Taking the latter returns, where they are available, we shall find the increase still greater, as in 1846, for instance:

	Passengers.	Goods. Tons.
Estimated traffic,	4,135,836	1,038,504
Realised traffic, 1846,	13,718,503	3,530,441
Excess over estimates,	9,572,667	2,492,937
Increase per cent.,	230	250

The traffic on these lines stands as follows:

	Passengers.	Goods. Tons.
Estimated,	4,135,836	1,038,504
Realised, 1845,	10,868,503	2,751,180
" 1846,	14,078,697	3,530,441

The lines for which there are separate returns in 1847, are as follows:

Great Western, &c.	231 miles.
Glasgow and Ayr,	18¾ "
Lancaster and Preston,	20 "
Dundee and Arbroath,	16½ "
Sheffield and Manchester,	44½ "
South Eastern,	67 "
	297¾ "

The traffic stands thus:

	Passengers.	Goods. Tons.
Estimated,	2,378,995	529,618
Realised 1845,	5,138,041	604,641
" 1846,	7,006,625	891,333
" 1647,	7,382,586	1,236,081

The actual increase of traffic depends upon the length of time given for its development, beginning at 160 per cent. and going up to 230 per cent., and in the case of the selected railways, even more. Taking the increased accommodation to passengers at 160 per cent., this would give the following as the increased number of travelers provided with traveling accommodations in each year:

1844, - -	17,400,000
1845, - -	20,800,000
1846, - -	27,000,000
1847, - -	30,000,000

If the proportion be taken at 200 per cent., the number accommodated by railway, for whom no accommodation was before provided, would be 34,000,000.

The following shows the proportion of traffic on railways in each year for which accommodation by coach, &c. was provided, and for which no accommodation by coach, &c. was provided:

	Travelers from old coaches, &c.	New Travelers.
1844,	10,300,000	17,400,000
1845,	12,900,000	20,800,000
1846,	16,000,000	27,000,000
1847,	21,000,000	30,000,000

Reckoning that each passenger is on the average carried 20 miles, each male adult in this country will be carried that distance six times in the year,—an extent of accommodation which must have a great effect on trade, and on the distribution of labor.

It appears from the averages given in the returns of the railway department, that there has been a still further reduction in fare on most of the lines, and an increase in the average speed per mile.

The total increase on each class of passengers is as follows:

	1845.	1846.	1847.
1st class,	599,831	686,191	412,460
2nd class,	2,190,139	2,615,240	1,768,223
3rd class,	5,552,735	5,471,707	4,344,376
Altogether,	6,028,651	9,999,730	7,561,180

It is to be observed that these figures cannot be absolutely relied on, as the proportions of each class cannot be fully shown, on account of the confused state of the returns published by the railway department.

The total increase on each class of passengers between 1844 and 1847, has been as follows:

1st class, - -	1,697,392
2nd class, -	6,463,602
3rd class, - -	14,267,718
Altogether, -	23,588,561

This is probably more than the whole traffic of the country in 1825, and it shows at any rate that there has been a great increase in the accommodation given to the working classes.

No. 2.—Cattle Traffic. The last parliamentary returns are still more defective than their predecessors, so that it is necessary to estimate some of the numbers.

The following shows the number of cattle carried in the year ending 1st July, 1846:

Cattle,	370,000
Sheep,	1,250,000
Swine,	850,000
Total,	2,470,000

This shows an increase of 25 per cent. over the number of animals carried in 1845.

On account of the very imperfect state of the returns, it is impossible to give the proportion paid in 1846 under each head of the cattle traffic. In 1845 the proportions were:

Cattle,	£30,000
Sheep,	26,000
Swine,	30,000

The proportion for cattle must now be larger, and that for swine smaller.

The whole number of cattle in 1847 will therefore be as follows, allowing for the incompleteness of the returns:

Cattle,	500,000
Sheep,	2,000,000
Swine,	390,000
Total,	2,890,000

Making nearly three million head of stock. The falling-off in swine arose from the Irish famine.

The total receipts for cattle traffic in each year were as follows:

1845,	£102,000
1846,	167,200
1847,	183,400

The great advance in cattle traffic was made in 1846; but the progress was not so great in 1847, as there was a positive falling-off in the number of swine carried. The greatest increase is in the conveyance of fat stock and sheep.

The following are the proportions of cattle carried in each year:

	Cattle.	Sheep.	Swine.
1845,	236,000	1,200,000	550,000
1846,	370,000	1,250,000	850,000
1847,	500,000	2,000,000	399,000

Civ. Eng. & Arch. Jour., Aug. 1848.

(To be Continued.)

Savings by Railways.

An "Observer," in the Morning Herald states that it has been estimated that railways have effected a saving of £12,000,000 annually on the traffic of the country, although they comprehend as yet but a fraction relatively of the whole traffic of trade. Among other items of traffic he states that of building-stone to be not one-tenth of what is requisite for even a fourth part of the surface, "and whereas stone might be brought up to the metropolis at one penny per ton per mile, by the London and North-Western and Great Western Railways, little is so brought, though there is a great wish to have public buildings of stone instead of brick."

Lond. Build., Nov. 1848.

Report upon the Use of Anthracite Coal in Locomotive Engines on the Reading Railroad, made to the President of the Reading Railroad Company, by GEORGE W. WHISTLER, JR., *April* 20, 1849.

JOHN TUCKER, ESQ., *President.*

Sir:—Agreeably to your request that I should make to you a report of my observations upon the Reading Railroad, relative to the use of anthracite coal in Locomotive Engines, comprehending its present comparative results with the Engines burning wood upon that road, and its ultimate economy, deduced from such data as I am enabled to get from this and other roads using raw coal as fuel, I beg to submit the following statements:

The Comparison of Engines in their Consumption of Fuel.

The observations made by me upon the Reading Railroad, were between the 23d September and 26th October of the past year, during which time I was absent from the road for a period of two weeks, making examinations of a similar character upon the Hazleton and Beaver Meadow Railroads. The number of trips which I record are, 17 of the *Baltimore Coal Engines;* 5 of the eight-wheeled Coal Engine *Novelty;* and 3 of the eight-wheeled wood-burning Engine *Indiana.* There were four other trips made upon the *Baltimore Coal Engines*, but not taken into this account; two were broken by derangement to the Engine, and two were neglected, being way trips. Two additional trips were made with the *Novelty;* upon one the coal for the use of the Engine was lost, and upon the other a derangement of the Engine spoiled the trip. A fourth trip was also made upon a wood Engine, but with a way train, and is not included in this account.

I give you, further on, a statement of each trip as it was made, and from which I have calculated the table of comparative results.

For making these observations, I had every facility extended to me by Mr. G. A. Nicolls, the Engineer and Superintendent of the road, and all information relative to repairs of Engines necessary to a satisfactory comparison, furnished me. I was also permitted to take any Engines in the coal trade for trial, and run them over the road at such times as would subject them to the least delays, and give the most daylight for the observations. I availed of this privilege but twice; being desirous that the trips should be made under the same circumstances as those recorded each day of the wood Engines, which were running in their turn by the regulations of the road, and the quantities of fuel used (consumed or wasted) for each trip was recorded.

As care is taken to ascertain the quantities of fuel used by the wood Engines, a statement of which has been made to yourself by the Engineer and Superintendent, showing what that quantity was for July and August last, I have not considered it necessary to make observations upon these Engines, further than to ascertain if the frosty season of the year, during which they were made, caused any material difference in these results, but as I found none the trips were soon discontinued. With the coal Engines, however, the amounts of fuel consumed per trip have not been ascertained, and my observations have been directed more particularly to them. The fuel used for the coal Engines was, in all cases, noted as the difference in weight between that taken at one end of the road and that remaining at the other. Of the trips here recorded I made seven myself, two upon a *Baltimore Engine* and five upon the *Novelty;* and was assisted in the remainder by young men whom I put upon the Engines.

BALTIMORE COAL ENGINES.

Direction.	Date.	Engine.	Load.	Fuel.
Richmond to Pottsville,	Sept. 23	Delaware,	100 Cars.	4·25 Tons.
Pottsville to Richmond,	" 24	"	95 "	4·50 "
" "	Oct. 11	Ohio,	95 "	5·55 "
Richmond to Pottsville,	" 12	"	100 "	5·30 "
Pottsville to Richmond,	" 13	"	95 "	5·15 "
Richmond to Pottsville,	" 14	"	100 "	5·00 "
Pottsville to Richmond,	" 14	Maryland,	95 "	4·00 "
Richmond to Pottsville,	" 16	"	94 "	3·50 "
Pottsville to Richmond,	" 17	"	85 "	5·25 "
Richmond to Pottsville,	" 18	"	94 "	4·75 "
Pottsville to Richmond,	" 19	"	85 "	4·75 "
Richmond to Pottsville,	" 20	"	94 "	4·50 "
Pottsville to Richmond,	" 21	"	85 "	5·30 "
Richmond to Pottsville,	" 24	"	94 "	4·75 "
Pottsville to Richmond,	" 25	"	85 "	5·05 "
Richmond to Pottsville,	" 23	Delaware,	94 "	4·50 "
" "	" 26	"	94 "	3·80 "
Total quantity of coal used on 17 trips, ...				79·90

9 trips up, coal used = 40·35 = 4·45 per trip.
8 " down, " = 39·55 = 4·95 " = 9·40 per round trip.
Average load down, 90 cars, with 450 tons of coal.

As the results here given are inclusive of all waste, a deduction should be made, and a quantity of coal somewhat nearer that actually consumed taken for a comparison with wood. The coal supplied for Locomotive Engines to the Reading Road is of good quality, (Forest Improvement,) the only drawback being the large per centage of fine coal and dirt intermixed with it. Cars containing 5·5 tons in weight, have in them from a half to one and a half tons of this dross, a part of which is thrown from the tender upon the road and estimated as fuel consumed.

This waste amounts to about half a ton per trip; I propose, however, to deduct but five per cent. from the gross weight, as that allowance is made by the parties furnishing coal, and has no corresponding equivalent in wood.

Five per cent. deducted from 79·9 leaves 76 tons of coal for 17 trips.
Trip up = 4·25 tons. Trip down = 4·75 tons. Round trip = 9 tons.

ENGINE NOVELTY.

Direction.	*Date.*	*Load.*	*Fuel.*
Richmond to Pottsville,	Oct. 10	85 Cars.	5·75 Tons of Coal.
Pottsville to Richmond,	“ 11	80 “	6·00 “
“ “	“ 13	71 “	5·45 “
Richmond to Pottsville,	“ 14	85 “	5·50 “
Pottsville to Richmond,	“ 16	72 “	5·40 “

Total quantity of coal used in 5 trips, 28·10 Tons.

2 trips up, coal used 11·25 = 5·62 tons per trip.
3 “ down, “ 16·85 = 5·63 “
Coal used per round trip, 11·25
Deduct 5 per cent. for waste, 10·70 tons per round trip.
Average load down, 75 cars, with 375 tons of coal.
The fuel used Oct. 16th, includes half a cord of wood, which is estimated as one quarter of a ton of coal.

ENGINE INDIANA.

Direction.	*Date.*	*Load.*	*Fuel.*
Richmond to Pottsville,	Oct. 9	95 Cars.	6·87 Cords of Wood.
Pottsville to Richmond,	“ 10	88 “	7·37 “
Richmond to Pottsville,	“ 11	95 “	7·13 “

Total quantity of fuel used on 3 trips, 21·37 Cords.

2 trips up, wood used 14 cords = 7 cords per trip.
1 trip down, “ 7·37 “ = 7·37 “
Wood used per round trip with 88 cars down, containing 440 tons of coal, 14·37 cords.

By the reports for the months of July and August, the fuel used for the Engine *Champlain*, weighing 20 tons, on six driving wheels, with cylinders 16 in. in diameter by 18 in. stroke, and working its steam expansively, is 10·25 cords of wood per round trip of 190 miles.

The fuel consumed by the Reading-built six-wheeled Engines, shown in the statement for comparison, is taken from the report for July and August already referred to, as well as the average quantity of fuel per trip for all wood Engines in the coal trade during that time. The quantity and cost of fuel per 100 tons of coal transported, as shown in the summary of the foregoing observations, includes the return trips with empty cars, the power exerted in either direction being very nearly the same.

The Reading Railroad is 95 miles in length, with a total fall of 600 feet—greatest fall at any part of the road, 20 to 25 feet per mile; it has no ascending grades in the direction of the trade, except within five miles of Philadelphia, where assistant Engines are stationed. The return load for each Engine is about one-third the entire gross weight of train brought down, which is the weight of cars alone.

Weight of cars, 2·5 tons, coal in cars, 5 tons.

Total weight of coal and car, 7·5 tons of 2240 lbs.

Cost of wood in the following statement, $4 per cord, do. of coal, $2·75 per ton of 2240 lbs.

To facilitate a comparison of the various Engines on the road, a short description of their principal features is given.

Engine Novelty.

Engine on eight driving wheels, 46 inches diameter. Boiler on a separate carriage behind the Engine, and connected with it by flexible steam pipes, (a system of ball and slip joints;) weight of Engine 21·5 tons. Diameters of cylinders 18 inches, and length of stroke 20 inches. Area of fire grate 36 feet, fire surface 1085 feet. Placed upon the Engine is a cylinder of boiler iron about 42 inches in diameter, and 18 feet long, having a connexion with the water-tank, immediately behind the boiler. This cylinder of boiler iron answers the double purpose of giving adhesion to the Engine, and as a condenser for the exhaust steam from the cylinders, by which the water from the tank is heated before passing into the boiler; the combustion of coal is promoted by a fan blast.

Baltimore Engines.

Total weight of Engines with coal, fuel and water, 27 tons; weight on eight driving wheels 25 tons; do. on two small trailing wheels, 2 tons; diameter of boiler 42 inches; length of tubes 14 feet; diameter of do. 2⅝ inches; area of grate 18 feet; fire surface 957 feet; diameter of driving wheels 46 inches; diameter of cylinders 16·5 inches, and length of stroke 20 inches; the draft is regulated by the variable exhaust in the smoke stack; steam cut-off in the cylinders at half stroke.

Eight-Wheeled Wood Engines.

Total weight of Engines 22·5 tons, on eight driving wheels 46 inches in diameter. Cylinders 15·5 inches in diameter, and 20 inch stroke; fire surface about 875 feet; area of grate about 12 feet.

Tabulated Comparison of Engines on the Reading R. R.—Fuel Consumed.

Name or Class of Engines.	Number of driving wheels, each 46 in. diameter.	Weight on driving wheels.	Coal transported per trip by regulations of road.	Total gross load per round trip.	Coal transported per ton of adhesion.	Fuel consumed per round trip of 190 miles.	Water evaporated.	Fuel consumed per 100 tons of coal transported.	Cost of fuel per 100 tons of coal transported.	Comparative consumption of fuel.
		tons.	tons.	tons.	tons.	Tons of Coal.	galls.			
Baltimore Eng.	8	25·0	450	900	18·00	9·00	14,400	2·000	5·50	1·00
Novelty,	8	21·5	375	750	17·44	10·70	14,400	2·853	7·95	1·43
						Cords of Wood.				
Baldwin Large,	8	22·5	420	840	18·66	13·75	16,200	3·273	13·09	1·64
" "	6	19·5	375	750	19·23	13·00		3·467	13·87	1·73
Champlain,	6	20·0	375	750	18·75	10·25		2·733	10·93	1·37
Reading Eng.,	6	20·2	375	750	18·56	13·50		3·600	14·40	1·80
All Engines—July and Aug. per report of Mr. Nicolls,			400	800		13·42		3·355	13·42	1·68

The water evaporated in the Novelty's boiler does not include the condensed steam from the exhaust, a large portion of which forms a constant supply to the boiler.

The foregoing statement shows an accurate comparison of the coal and wood-burning Engines upon the Reading Road in their consumption of fuel; and as the observations have extended over a considerable time, I have no doubt these quantities will be found very near the actual consumptions per trip, during the mild seasons of the year, for then the delays are unimportant, and but few broken trips occur to swell the averages; still, as it is understood that the comparative and not the actual quantities of fuel consumed by each class of Engines is the information sought for, any want of accuracy in estimating the latter is unimportant.

I am aware that the results just given of the consumption of fuel differ from those given by Mr. Nicolls in the report made to yourself last fall. He there says, that in the spring of 1848 the Baltimore Engines used 9·64 tons of coal per round trip, but that great care was taken in the selection of fuel, and in running the Engines; and he further says, that it is his belief that the every-day consumption of fuel by these Engines is about 12 tons per round trip. That Mr. Nicolls is mistaken in his belief the facts will show; and he has allowed himself to be lead into this error by drawing hasty conclusions from unanalogous facts. Thus, as the experiments made in the spring of the last year show that 390 tons of coal were transported with an average expenditure of 10·89 cords of wood, and that 425 tons of coal were transported by the *Baltimore Engines* with a consumption of 9·64 tons of coal; that this proportion holds good between the wood and coal Engines at all times; and therefore, as the actual amount of fuel used by all the wood Engines, during the months of July and August, was 13·42 cords per round trip, transporting 423 tons of coal, the *Baltimore Engines* had consequently consumed about 12 tons of coal in transporting 475 tons of coal.

In determining the excellence of a Locomotive Engine, one of the most important points to be considered is the ability to generate an abundance of steam at all times, not only to do the work required of the Engine when all things are favorable to its well-working, but under ordinary or even adverse circumstances. To insure this, there is required for an Engine the power to burn a large or small quantity of fuel in a given time, and to this end a large fire-place and area through the tubes are necessary, with the means of increasing or diminishing at pleasure the blast of the exhaust steam. By such an arrangement the Engine-man has under control the draft through the fire, and with it the consumption of fuel, but upon the judicious management of this power, depends the merit of this first excellency in a Locomotive Engine.

The Baltimore Coal Engines have the abundance of steam-generating power for all emergencies, and under the control of the Engine-man; but the nature of anthracite coal as a fuel for Locomotive purposes, and the want of experience in its use, will prevent, for a time, that degree of economy in its consumption which is attained with wood under the same circumstances, but by long experience.

The Reading Railroad Company have at present but few coal-burning Engines on their road; and as these have been in use but a few months, and no roads using anthracite coal furnish to it available experience, it is not to be expected that a comparison of the utmost economy of coal and wood, made in the spring of 1848, can be made the basis for a rule-of-three method of arriving at the present every-day consumption of this fuel; facts disprove it; for it will be seen by my own observations, that the average amount of fuel consumed during the ordinary working of these Engines for several successive days, over the road, does not exceed these last spring experiments, while single trips were made with very much less fuel; it is well known, also, that the Engines have not unfrequently been run with little more than one-half this consumption of fuel; but the want of experience in the use of anthracite coal with Locomotive Engines having the cut-off, and variable exhaust, has been a great drawback to the constant economical consumption of this fuel.

The success attending the use of anthracite coal upon the Beaver Meadow and Hazleton Railroads induced numerous attempts to be made by the Reading and other Railroad Companies, to introduce this fuel by similar means upon their own roads; but the length of road and heavy business to which the Engines were subjected soon proved its impracticability; showing, moreover, that the successful burning of anthracite coal upon the Beaver Meadow and Hazleton Roads does not depend so much upon the peculiarities of their Engines—consisting in an absence of ash-pan and the exhausting in numerous small jets up the smoke stack, for the purpose of equalizing the draft through the fire—as it does upon the short roads (each 14 miles) and the small amount of work done by each Engine; and my observations upon these roads convinced me that their own success falls short of the requirements of the Reading Road.

Now, while the quantity of fuel consumed per round trip, under the most favorable circumstances, in the *Baltimore Engines*, is stated by Mr. Nicolls to be 9·64 tons of coal, my own observations upon the every-day working of the road show, in one case, but 7·5 tons per round trip, and I have reason to believe that round trips have not unfrequently been made with as little as 6 tons of coal. Again, while Mr. Nicolls estimates that 12 tons of coal per round trip is the every-day consumption of fuel, the average of my own observations on seventeen trips is but 9 tons, and the daily observations of the Superintendents of Engines and Machinery at either end of the road, does not lead them to give a higher estimate than 9 tons per round trip.

In explanation of the excess of fuel used in the wood-burning Engines during the months of July and August, over the experiments made in the spring, Mr. Nicolls says that the quantities of fuel include that used for way and broken trips, which always swell the averages. The way trips are a very small proportion of the trips through (one in ten); and if broken trips have reference to short trips caused by accidents, these can have increased the quantities of fuel used per trip but slightly; for during July and August the road was remarkably free from accidents, I believe entirely so.

By last year's annual report, Mr. Nicolls estimates that 1,360,000 tons of coal were transported during twelve months, in average loads and with an average consumption of fuel per Engine as follows:

354 tons transported with 15·83 cords wood in 1847.
423 " " " 13·42 " " July & August, 1848.
69 " more " " 2·41 " " less.

There may be great economy in the consumption of fuel this year over that shown in the report for last year; but I doubt if the quantities for July and August could be reduced, for the work done, below the statement made above.

With respect to the *Novelty*, and her performance as a coal-burning Engine, I have little to say; I was so fortunate as to see the Engine for several successive days, under admitted favorable circumstances, and though it made good time over the road, I could but agree in the opinion generally entertained and expressed of its entire impracticability.

It may be a matter of surprise that this Engine, provided with a condenser, and having twice the area of grate that the *Baltimore Engines* have, should consume nearly half as much more fuel in doing the same work; but a large per centage of the steam generated is required to drive a fan; and again, there is a loss by condensation and leakage in the steam pipe leading from the boiler to the cylinders, which is about thirty feet long, and greatly exposed; there is also a waste of fuel in the fire-place, caused by its very great size, the heat being so intense from the mass of fire exposed, as to prevent the men from clearing the grate of cinder, except just at the door, and consequently the cinder and coal accumulate upon the grate, and the blast has gradually to be increased as the Engine progresses on its way. The loss of fuel from this cause is apparent on the last twenty miles of each trip, the gases formed by the partial combustion of coal being burned at the chimney top.

To be Continued.

Increased Draft in Locomotive Flues.

A patent has been taken out by Mr. E. Albon, for an apparatus for regulating and increasing the draft in locomotive chimneys. It consists of a pipe of copper, or other suitable material, affixed to the chimney, one end of which is bell-mouthed and open to the atmosphere, and the other turns upwards into the smoke-box in a perpendicular direction: the blast or steam-pipe passes up through the bend, and, by its exhausting action, it is stated, causes the air which passes in at the bell-mouth, to rush rapidly through the same into the chimney. By this means, it is said, the current will be regular, though the steam is intermittent.

Lon. Build. Nov. 1848.

London and North-Western Railway.

The Euston station, which has been recently completed by Messrs. Braure and Gwyther, of Birmingham, at a cost of about £150,000, is situated between Seymour street and Whittlebury street, and comprises an area of about 2100 feet in length, by 500 feet in breadth. On either side is a platform; the one on the east, or the arrival platform, is 1100 feet in length, and about 40 feet in width; and the departure platform is about 800 feet in length. In this space on the various lines there are 60 turn tables, and over this are about 700 feet by 350 feet of glass roofing. There are also 16,000 feet of drains and sewage, which have been constructed under the direction of Mr. M. A. Watkins. On the west side, adjoining Codrington street, a number of coach factories have been erected, the area occupied by these being 300 feet by 400 feet. A smithey, with every convenience for the manufacturing of vehicles, is attached. In the course of the past week the waste materials which were not required by the contractors, were sold, and realized nearly £1000.

The following is the number of persons employed on account of this company, including those occupied in the collection and delivery of goods: 2 secretaries, 1 manager, 2 superintendents, 966 clerks, 3054 porters, 701 police constables, 738 engine and firemen, 3347 artificers, 1452 laborers; total number, 10,263. The number of horses employed is 612; ditto vans, &c., 253. Lond. Min. Journ, Dec. 2, 1848.

Report to the President and Directors of the Ohio and Pennsylvania Railroad Company. *By* Solomon W. Roberts, *Chief Engineer.*

(With a Map.)

One of the greatest enterprizes ever undertaken in America, is the Great Central Railroad of Pennsylvania from Philadelphia to Pittsburg.

But it can never take rank as the first of all the thoroughfares between the East and the West, until it is connected with the railroads of Ohio, and of the States further west.

To accomplish this connexion is the primary object of the "Ohio and Pennsylvania Railroad."

For this purpose the Company has been granted a perpetual charter by both the States which have given it their names. The Corporation is a unit, with concurrent powers in both Commonwealths; and certified copies of the necessary laws have been interchanged between their respective Governors.

Most of the railroads in the State of Ohio run in a northerly and southerly direction, to connect the Ohio river with Lake Erie. The general direction of the "Ohio and Pennsylvania Railroad" is easterly and westerly, running over the elevated and highly cultivated table lands, and intersecting the other roads.

It will thus become a "Back-bone Line, of which they will represent the ribs.

The road begins at Pittsburg, where the "Pennsylvania Railroad" ends. The first points west of Pittsburg, fixed in the charter, are Canton, the county town of Stark county, Ohio, 92 miles from Pittsburg, and Massillon, the great wheat mart of Ohio, on the Ohio canal, 101 miles from that city.

Very extensive and elaborate surveys have been made to ascertain the shortest, cheapest, most productive, and best line between Pittsburg and Canton and Massillon.

Soon after my appointment as Chief Engineer of the Company, the surveys were begun, under my direction, on the 11th of July, 1848, and they have resulted in proving the important fact, that the best route for the railroad, in a commercial sense, is also the best in an engineering point of view.

Commencing at the twin-cities of Pittsburg and Allegheny, the line continues along and near the northerly bank of the Ohio river to the mouth of the Big Beaver river, a distance of twenty-five miles.

It may conduce to perspicuity to consider the road, in the first instance, in separate divisions. And as this report is based upon our preliminary surveys, my object will be to give correct general views rather than much minute detail.

From Pittsburg to Beaver, 25 miles.

This portion of the road, being in the valley of the Ohio river, on its northern side, is estimated to cost $10,000 *per mile, for grading and bridging.* This supposes the work to be done in a substantial manner, for a single track and turnouts. It would be easy to make a lower estimate; but, considering the importance of this part of the road, a less sum ought not to be expended upon it. The public is too often misled by insufficient estimates of the cost of such enterprises; but it should never be forgotten that only a certain amount of work can be done for a certain sum of money; and, on main trunk-lines, if the means required to build them *well* cannot be raised, it only shows that the time for beginning them has not arrived.

There are few places in the United States where a piece of railroad is likely to pay so well as between Pittsburg and Beaver.

The valley of the Ohio river here is the narrow neck of a vast funnel, of which Pittsburg is the outlet, and which expands at the mouth of Big Beaver, to the north-west towards the lakes, and to the south-west towards the Mississippi.

At Pittsburg the Pennsylvania Canal terminates, and at Beaver the canal connecting with Lake Erie, at Erie and Cleveland, begins. The termini of these canals have no canal connexion, and the only land carriage is by a common country road. The Ohio river, between these points, is a broad, rapid, and shallow steam, falling 35 feet in 28 miles, and having, in low water, a narrow and crooked channel obstructed by bars. In summer and autumn the droughts stop all but the smallest class of steamboats, and in winter the navigation is sometimes closed by ice. These facts are well known to the merchants and manufacturers of Pittsburg, as well as to the hotel-keepers and the traveling community. The remedy is obvious. A railroad, 25 miles long, will carry people in an hour, where they are now often detained on steamboats half a day.

Without taking into the account the passengers on the larger boats, an examination of the books of the small steamboats plying between Pittsburg and Beaver has shown that they carry, on an average, 163 passengers *each way* per day, or 326 in the two directions between those points. If we follow the English rule of multiplying by four to estimate the number of passengers that will travel after good railroad facilities are established, it will give us 1300 passengers per day, which, of itself, without counting anything for freight, or anything for through travel, would more than justify the construction of this portion of our road.

If we estimate for only 600 passengers per day throughout the year, at 50 cents each, it will give us $300 per day, to which we may add half that sum, or $150, for freight and merchandize of all descriptions, making $450 per day; which, multiplied by 313 working days per annum, gives a product of $140,850 gross receipts. If we deduct one-third for expenses, there will remain a balance of $93,900 net receipts, or more than 15 per cent. per annum on an invested capital of $600,000; supposing so large a sum to be invested in constructing, furnishing, and stocking the first or city division of the road, extending from Pittsburg to Beaver, 25 miles.

If any one considers the foregoing to be an extravagant estimate of travel, let him recollect the fact that on the Glasgow and Greenock Railroad in Scotland, which competes with the steamboat navigation of the tide-way of the Clyde, the introduction of the railway, with low fares, has increased the number traveling from 110,000 to 2,000,000 per annum, being an increase of 19 fold, and equal to five times the population of the district.

We may estimate the population of the twin cities of Pittsburg and Allegheny, with the contiguous towns, at 70,000, and that of Beaver, including Brighton, Rochester, and the adjacent villages, at 10,000. Pittsburg has vast steam power, and Beaver great water power. Both are important manufacturing towns, united by numerous and constantly increasing commercial ties. Pittsburg is the greatest place in the west for the working of iron, and Beaver ought to be the greatest for the grinding of flour. In my opinion, the construction of our railroad, passing through four of the best wheat counties of Ohio, will make it so.

The population of both is rapidly increasing, and, with the increase of facilities, the travel will increase in a compound ratio, and Beaver will become a suburb of Pittsburg. The land along the line will be brought, as it were, close to the city, and will be valuable for many purposes, and especially for kitchen-gardens, dairy-farms, and country seats.

There need be no fear of the construction of a rival railroad between Pittsburg and Beaver. On the same side of the river space cannot be found for it, and on the opposite side a road would have to encounter the cost of two enormous bridges, which must be so lofty as to clear the tall chimneys of the largest steamboats at the highest water, making the track so high as to be out of the reach of facilities for business. No other plan seems open to a railroad attempting to enter Pittsburg on the south, unless it be by a line built on the river, cutting off Sligo from its river front, and crossing above the Monongahela bridge. Such a line could not, by any convenient means, connect with the Pennsylvania Railroad, excepting at a point on the Monongahela, some miles above Pittsburg.

On the whole it is clear that our road between Pittsburg and Beaver must be a most profitable investment, provided it be judiciously constructed and managed, and provided the requisite funds are obtained, so as to protect the interests of the stockholders, and not to permit financial sacrifices to add to the cost of the work.

Wherever a railroad is begun for which the whole capital required to complete it throughout cannot at once be raised, it is highly important to finish and bring into speedy use some portion of the most productive part of the line, the usefulness and success of which will insure its extension.

Such a course secures original subscribers to the stock from loss, and gives confidence to capitalists, who are thus induced to seek the stock as a profitable investment, and to furnish the funds for the rapid extension and completion of the work.

One main cause of the remarkable success of the railroad companies in New England has been their not beginning more than they were able to finish; and the losses on such enterprizes, experienced in some other parts of the Union, are to be attributed, not so much to bad engineering, as to the pursuit of a contrary policy, which, preferring the counsel of hope to that of experience, and beginning the work along an extended line with insufficient capital, has resulted too often in swamping the company in debt, and compelling it to submit to the most injurious financial sacrifices.

While our work is in its infancy, we have the opportunity of profiting by all the experience of the past, in order to make its success certain.

From Beaver to Salem and Mount Union.

On this part of the line we reach the elevated table-lands of the State of Ohio, so favorable for railroad construction, and so celebrated for the production of wheat.

Under the head of Ohio, in a book on the Public Works of the United States, published in 1840, by the distinguished geographer, Henry S. Tanner, there is a remarkably correct description of the topography of the State.

Mr. Tanner says: "Westward from the valley of the Allegheny, *that of the Beaver exhibits the commencement of the* CENTRAL PLAIN, which divides the basins of the Mississippi and St. Lawrence. This plain stretches westward, and, widening in extent over the States of Ohio, Indiana, and Illinois, reaches the Mississippi river."

It is over this elevated plain that the route of our railroad runs, and our point of divergence from the Ohio river is at the mouth of the Beaver, which is the first practicable point of divergence west of Pittsburg.

To quote again from Mr. Tanner's book, he says: "For the construction of canals and railroads, the entire region comprehended by the States of Illinois, Indiana, Ohio, and Michigan, presents fewer impediments to the construction of such works than any other with which we are acquainted." "Perhaps the best idea of the topography of Ohio may be obtained by conceiving the State to be one vast elevated plain, near the centre of which the streams rise, and in their course wear down a bed or valley, whose depth is in proportion to their size, or formation of the earth over which they flow; so that the hills, with some few exceptions, are nothing more or less than cliffs or banks, made by the action of the streams; and, although these cliffs or banks, on the rivers or larger creeks, approach the size of mountains, yet their tops are generally level, being the remains of the ancient plain."

The results of our surveys corroborate the foregoing description. The southern and south-eastern parts of Ohio are cut up by the deep and crooked valleys, in which numerous streams flow on their way to empty into the Ohio river. Railroad lines following these streams must be very crooked, and lines crossing the streams and the intervening ridges must encounter still greater difficulties.

We have found that *the northern route, which we have adopted, turning the hill country on its northern flank, is the shortest and best route to the table lands of Ohio.*

It has also the advantage of crossing the streams where they are small, thereby reducing the amount of bridging required, as we cross no stream where it is large, excepting the Beaver at New Brighton, which at that point may be readily bridged.

The northern route, by Salem, by means of its connexion with the Cleveland Railroad near Mount Union, will afford the shortest and best line between Pittsburg and the important city of Cleveland on Lake Erie; 75 miles of the distance being traversed on our road, and 60 on the Cleveland road. The line will cross the river-hill summit near the present mail stage route. The summits here are materially lower than on the more southern lines, and our course has less curvature and a shorter distance. This matter has been very fully investigated, and the results of our preliminary surveys show, that of the different lines examined, the one by way of Yellow creek comes next in order to ours, and that, from Pittsburg, ours has an advantage over it of about ten miles in distance, to Cleveland on the lake, and seven miles to Canton, Massillon, and the west. If we adopt the usual estimate of $50,000, as the amount of capital, which is equivalent to the saving of one mile of absolute distance on a great railroad thoroughfare, this will make a difference of $500,000 in favor of our road as a route to the lake, and of $350,000 as a route to the west, and *both these advantages are combined by us in one line.*

Besides which, in view of the construction of rival roads to Wheeling, it is evidently of the first importance to the interests of Pittsburg, that her GREAT WESTERN RAILROAD *should strike the Ohio river as high up as possible, which our line does at Beaver.*

A line has been talked of from Pittsburg across the hill country of Washington county, and through a portion of the territory of Virginia, to strike the Ohio river opposite Steubenville, and to connect by means of an immense bridge, with a railroad chartered in Ohio, to terminate at that place. Such a line would encounter much unnecessary elevation for the purpose of cutting off the northern bend of the Ohio; it would be of no avail as a line to Lake Erie, or to those rich agricultural counties traversed by our road; and even as a line to Cincinnati and south-western Ohio, the saving in distance would be inconsiderable Assuming $5000 as the average cost of grading and bridging a mile of railroad in Ohio, the bridge at Steubenville, if built in such a way as not to obstruct the navigation, would probably cost as much as the grading and bridging of *fifty miles* of such railroad. The distance down the river bank from Steubenville to the Wheeling bridge is about 20 miles. The difficulty of bringing such a line into Pittsburg without obstructing the harbor has already been adverted to; and if it should ever be constructed, it will probably connect with the "Pennsylvania Railroad" at or near the mouth of Turtle creek, on the Monongahela.

Many persons are misled, when judging of railroad routes, by what they see on ordinary maps of the course of common roads, forgetting that such maps do not indicate the elevations of the ground, and give very imperfect information as to the distances by railroads of moderate grades and curvatures in a broken country. If, in order to avoid bridging the Ohio, a railroad should be brought from Steubenville to Pittsburg, along the river bank, via Wellsville, the distance to Cincinnati by that route will be greater than by our "back-bone line," diverging at Beaver, and if the route across the country and across the river be adopted it will be very little less, and the important towns at the mouth of Beaver will not be touched, though they are more populous and important than Steubenville.

Heavy bridges cost much to build them and much to keep them up, and are liable to casualties from fire and flood. If of long span, great expense is required to make them stiff enough for locomotive engines; they need watchmen, and are not easily insured.

The results of our preliminary surveys conclusively show that our route from Beaver and New Brighton, by Salem, to Mount Union, possesses a combination of advantages not to be met with on any other line. The distance from Beaver to the point of intersection with the Cleveland Railroad, near Mount Union, will be about fifty miles; and progress will speedily be made in the definite location of the line, the experimental surveys of which have been already tested. The passes of the natural summits of the river hills, from which the selection of a point of crossing is to be made, vary from 450 to 500 feet above low water at the mouth of Beaver, being a less elevation than on the more southerly routes. In reaching the summit between Big and Little Beaver, grades of from 40 to 50 feet per mile will be required; the latter of which is the maximum used on the Western Division of the "Pennsylvania Railroad."

The line which we have adopted traverses the broad belt of elevated, highly cultivated, and populous table-land which intervenes between the Sandy and Beaver canal on the south, and the Pennsylvania and Ohio canal (commonly called the "cross-cut" canal) on the north, and not far from the centre of which the flourishing town of Salem is situated. On an average, our "back-bone line" is about ten miles north of the Sandy and Beaver canal, and twenty miles south of the "cross-cut" canal. We traverse a very fruitful country, inhabited by a moral, industrious, and thriving population, who now have no communications but common country roads, made over an alluvial soil, and very bad in wet weather. The expense of land carriage is so great that, in my opinion, the increased value of real estate, caused by the construction of our railroad, will more than equal the whole cost of it, without reckoning its other advantages.

In Beaver county our line opens an extensive field of bituminous and also of cannel coal, both of excellent quality. For making steam, for making gas, and for domestic use, the cannel coal is a most beautiful fuel, and the bed is about eight feet thick. We will thus have every opportunity of obtaining for our locomotives the best fuel at the lowest rates, and of reducing the expense of motive power to a minimum. Those familiar with the management of railroads in operation best know the importance of this advantage. Cheap fuel is the first element of cheap transportation. The same cause which enables us to carry cheaply, will also give us a heavy tonnage to carry, for the coal trade upon the line will be of great magnitude and importance.

These are some of the reasons why the interior route which we have adopted is preferable to a route along the river shore below Beaver. Instead of being hemmed in by the river on one side and the hills on the other, we have a broad tract of open country tributary to our line on both its sides. The table-lands are very favorable for the construction of improvements, and we have reason to expect branches, either by railroads or plank roads, both from Newcastle and Warren.

The distance from Beaver to the State line will be about twenty miles, estimated to cost for grading and bridging $10,000 per mile. After crossing the State line into Ohio, we estimate the average cost of grading and bridging at $5000 per mile. These estimates are for a substantial single track railroad with the necessary turnouts, the usual maximum grade being forty feet per mile, and the minimum radius of curvature one thousand feet. In many places, where the ground will readily admit of it, it is intended to grade the road-bed wide enough for a double track in the first instance.

It has been represented by parties locally interested in diverting our railroad to the town of Wellsville, and to the mouth of Yellow creek, on the Ohio river 50 miles below Pittsburg, that our line to Mount Union could not be materially shorter than one in the Yellow creek valley, because Wellsville is not very far from a straight line drawn on an ordinary map from Pittsburg to Cleveland. But if any one will take the trouble to draw such a line, he will see that it crosses the river twice, and that Beaver, where our line diverges from the river, and which is the most northerly point upon the Ohio, and where its southerly bend begins, is the true point from which a fair comparison of distances must be made. The results of actual and repeated surveys have, however, conclusively answered this question.

We are not engaged in locating a paper railroad nor a local line. The work which we have in hand will be the second link in the shortest and best chain of railroads between the eastern Atlantic cities and the vast west, of which the first link is the Pennsylvania Railroad.

Our road will be the Union line between the railroad system of Ohio, the first agricultural State, and that of Pennsylvania, the first manufacturing State in the Union. Where we connect them these States are contiguous and divided but by an imaginary boundary. When its importance is duly considered, the claims of most other railroads which are urged upon public attention sink into insignificance in comparison. Gradually the public mind will become aware of the truth of this fact.

Such being the case, it becomes us to act with caution and firmness, aware that as we do our work well or ill, it will be a lasting honor or a lasting disgrace to us. In determining the route between those town which are made fixed points by the charter, or which become so on account of the topography of the country, that line which is best for the general public will also be the best for the whole of the stockholders as a corporation. It was the assurance given me, that the Board of Directors were determined that the location should be decided upon these principles, that induced me to accept at their hands the appointment of Chief Engineer of the Company.

The citizens of Pittsburg, the citizens of Philadelphia, and the great body of the people of Pennsylvania, have a vast interest in securing the the best railroad route westward from Pittsburg. It may be said that it is desirable to have more than one such road; but if so, how important it is that the best and most profitable should be made first, and that there should be a concentration of effort upon it until it is accomplished. This is especially desirable when we consider the difficulty of raising capital for such enterprises. Local interests on other lines may controvert this doctrine, but it commends itself to the common sense of every man who is free from local bias, and who wishes to promote the general interest of the community. Sooner or later the best line will be made, then let it be made first.

When we see the New York and Erie Railroad pushing forward on the north, and the Baltimore and Ohio Railroad on the south of us, and both companies acting with renewed vigor and redoubled energy; and when we know that the broad plains of Ohio are the battle field upon which the sea-coast cities of the east are to contend for the trade of the west, we must feel that this is no time to sit down supinely, or to content ourselves with talking about the importance of going on with our work. The time for action has come, and that which is needed is such a subscription to the stock of the Ohio and Pennsylvania Railroad Company as will lay a broad and solid foundation on which the superstructure of the enterprise may safely be erected.

The rapidity with which commercial changes are effected is one of their most remarkable characteristics. In less than twenty years railroads have revolutionized the inland transportation of civilized communities. It is in vain to think of moving on in the old way, when others all around us have called to their aid newer and more active instruments of commercial power. If we do not hasten to avail ourselves of the most recent improvement, we will speedily be distanced in the race of commercial competition. A large town, which has no railroad, will soon cease to have many visiters.

It is believed to be a fact, that the "*Iron City*," as Pittsburg is often called, is the only one of its size and importance in our country that has no railroad.

It will require the construction of about 75 miles of railroad to connect with the Cleveland road near Mount Union, and when that is accomplished, Pittsburg will have a railroad communication by the the most direct and best route, through the Western Reserve of Ohio, to the important city of Cleveland on Lake Erie, the whole distance being about 135 miles. The line will traverse a very populous country, and will furnish a most important outlet for Pittsburg manufactures.

The distance by railroad from Cleveland, by the way of Pittsburg, to Philadelphia, will be 493 miles; while to New York, by Dunkirk, will be 630 miles, and by Buffalo 665 miles; so that much the shortest route from Cleveland to New York will be through Pittsburg and Philadelphia.

A railroad is in rapid progress of construction from Cleveland to Columbus, by what is called the western route, passing about twelve miles west of Mansfield. Its length is 135 miles, so that the railroad distance from Pittsburg to Cleveland will measure, as nearly as may be, the same as that from Cleveland to Columbus, each being 135 miles, and both together 270 miles.

In this way, as soon as our road is completed to Mount Union, Pittsburg will obtain, by a circuitous route, continuous railroad communications with central, western, and south-western Ohio, and those parts of the country will obtain a connexion with the eastern cities more direct than they can by the Lake route from Cleveland.

It is evident, from this, how greatly Cleveland is interested in the speedy completion of *the direct road* from that city to Pittsburg by the way of Mount Union.

The citizens of Salem are well aware of the great importance of our road to that flourishing town, which their energy has made to grow in spite of the disadvantage of having to haul every thing over common country roads.

That the Ohio and Pennsylvania Railroad, when completed from Pittsburg to Mount Union, will be, if properly conducted and managed, a highly productive investment, there is no doubt in my mind. It will confer innumerable advantages upon the country through which it will pass, will vivify industry in all its forms, and raise the value of real estate in a remarkable degree.

(To be Continued.)

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

Remarks on the Resistance of Posts to Flexure. By H. Houpt, *Civ. Eng.*

The ordinary formula for the stiffness of beams, supported at the ends and loaded in the middle, is

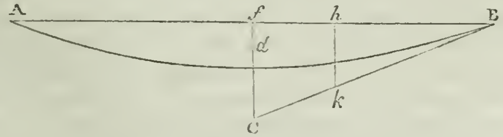
$$w = \frac{b\ d^3}{c\ l^2},$$

in which (w) represents the weight which produces a given deflexion; b=breadth in inches; d=depth in inches, and l=length in feet; c is a constant, to be determined by substituting the values of the other quantities in the equation.

In making experiments to determine the constant from this formula, it is necessary to observe very accurately both the weights and the deflexions produced by them, and then, by means of a proportion, find the value of (w) which will produce the deflexion required to be substituted in the formula.

In reflecting upon the circumstances connected with the flexure of beams, the writer conceived the idea of deducing an expression for the weight which a post would support from the ordinary formula for the stiffness of a horizontal beam, by the following considerations: If a beam is bent by an applied weight, there will be a tendency, from the elasticity of the material, to recover its form when the weight is removed; but if the ends are fastened by being placed between resisting points, so that the piece cannot recover its shape, there must be a horizontal force caused by the reaction of the material, and this force is such, that if the beam were placed in a vertical position and loaded with a weight equal to it, the deflexion should be the same as that of the horizontal beam, and consequently the extreme limit of the resistance of the post to flexure would be determined.

To ascertain the force which is exerted by the reaction of a bent beam in the direction of the chord of the arc.



Let A B represent a beam, supported at the ends and loaded with a weight (w) applied at the middle point.

d = deflexion caused by the applied weight.

B C = tangent of curve at B.

If the weight be removed, the reaction of the beam will cause it to regain its original figure if not resisted by a pressure at the ends. The force of this reaction will be proportional to the degree to which the fibres are strained, and as the strain upon the fibres is nothing at the ends A and B, and increases uniformly to the middle point, the force of reaction will be in the same proportion, and the point of application of the resultant of the whole of the reacting forces will correspond to the centre of gravity of a triangle whose base is $\mathrm{B}f$; it will consequently be at a distance from $\mathrm{B} = \frac{2}{3}\mathrm{B}f$.

The effect of this resultant acting at a distance $\frac{2}{3}\mathrm{B}f$, must be the same as the weight $\left(\frac{w}{2}\right)$ acting at a distance $\mathrm{B}f$, and must consequently be in proportion to $\frac{w}{2}$ as $3:2$. The value of the resultant is therefore $\frac{3w}{4}$.

The line of direction of the pressure at B being the tangent B C, the force of reaction at h may be considered as applied at the point k of its line of direction, and as $kh\mathrm{B}$ and $\mathrm{C}f\mathrm{B}$ are similar triangles, $\mathrm{C}f : f\mathrm{B} ::$ $\frac{3}{4}w :$ horizontal pressure at $\mathrm{B} = \frac{3}{4}w \times \frac{f\mathrm{B}}{f\mathrm{C}} = \frac{3}{4}w\frac{\frac{1}{2}l}{2d} = \frac{3wl}{16d}$. Representing this force by P we have

$$\mathrm{P} = \frac{3wl}{16d}.$$

As the deflexion of a beam within the elastic limits is always in proportion to the weight, if $(w') =$ the weight that will produce a deflection equal to unity, the deflexion (d) will require a weight $= (dw')$, and by substituting this value in the equation, we find

$$\mathrm{P} = \frac{3}{16}.\frac{dw'l}{d} = \frac{3}{16}w'l.$$

In this expression (d), which represents the deflexion, has disappeared, and as (w') is a constant quantity for the same beam, representing the weight that produces a deflexion equal to the unit of measure, it follows that P is the same with every weight and every degree of deflexion within the elastic limits.

This result seems at first view to be contrary to fact; it would appear that if the weight is increased, the horizontal strain should be increased in the same proportion; but when it is remembered that the deflexion increases with the weight, and that the former diminishes the value of P in precisely the same proportion that the latter increases it, the difficulty vanishes, and the reason why P should be constant for the same beam becomes obvious.

The practical importance of this result is very great, as it furnishes the means of obtaining a formula which will give at once the extreme limit of the resistance to flexure, or the weight which, applied to a post, will cause it to yield by bending.

As the formulæ used by Tredgold are calculated for a deflexion of $\frac{1}{40}$th of an inch to one foot, or $\frac{1}{480}$ of the length, the weight which would cause a deflexion of 1 would be $w\left(1 \div \frac{l}{480}\right) = \frac{480\,w}{l}$, and by substituting this value for w' in the equation

$$P = \frac{3}{16} w' l,$$

we find $P = 90\,w = A$.

But from the ordinary formula for the stiffness of a beam supported at the ends we have

$$w = \frac{b\,d^3}{c\,l^2}. \quad \text{Therefore } P = \frac{90\,b\,d^3}{c\,l^2} = B.$$

The expression $P = 90\,w$ shows that the extreme limit of the strength of any post whatever, of any length, breadth, or depth, or of any kind of material, is ninety times the weight which causes a deflexion of $\frac{1}{480}$ of the length.

The second expression, $P = \frac{90\,b\,d^3}{c\,l^2}$, will give the value of P directly, without first knowing the weight required to cause a given deflexion in a horizontally supported beam. In this expression, $b =$ breadth in inches, $d =$ depth or least dimension in inches, $l =$ length in feet, and $c =$ a constant to be determined by experiment for each species of material.

The value of c for white pine is ·01. By substituting this value, we find $P = \frac{9000\,b\,d^3}{l^2}$, a remarkably simple formula, which gives the extreme limit of the resistance to flexure of a white pine post.

The same expression may be used to determine the constants used in the ordinary formula for the stiffness of beams. For this purpose let the equation $P = \frac{90\,b\,d^3}{c\,l^2}$ be transposed, which will give $c = \frac{90\,b\,d^3}{P\,l^2}$. Find P by applying a string to a flexible strip of the material to be experimented upon, in the manner of a cord to an arc, and ascertain the tension on the cord with an accurate spring balance. It will be found that, whether the strip be bent much or little, the tension on the cord, as shown by the spring balance, will be constant, and this tension, in pounds substituted for P, will give the value of c without requiring, as is necessary with other formulæ, an observation of the deflexion.

Experiments made upon these principles with strips of white pine, yellow pine, and white oak, 5 feet long, $1\frac{1}{4}$ inches wide, and $\frac{1}{4}$ inch deep, give the following results:

The observed tensions were—

White Pine,	7¼ lbs.	value of $c =$ ·0097
Yellow Pine,	6½ "	" " $=$ ·0108
White Oak,	6¾ "	" " $=$ ·0104

As the stiffness is inversely as their constants, it follows that white pine is stiffer than yellow pine or oak. The experiments of Tredgold give similar results.

MECHANICS, PHYSICS, AND CHEMISTRY.

Report on the Gases evolved from Iron Furnaces, with reference to the Theory of the Smelting of Iron. By Prof. Bunsen, *of Marburg, Hesse Cassel, and* Dr. Lyon Playfair, *of the Museum of Economic Geology, Department of Her Majesty's Woods and Forests.*

From the Report of the British Association for the Advancement of Science, for 1845.

(Continued from Vol. xvii, page 393.)

The heat lost in a furnace may be easily compared with that actually realized. The following numbers exhibit the quantities of heat (expressed by the unities which we formerly described) generated during the combustion of the gases, and they show at the same time the part played by each constituent in the development of the heat:—

I.		II.
64·135	Nitrogen yields - - -	00000
33·758	Carbonic oxide yields - - -	84463
1·464	Light carburetted hydrogen yields	19719
0·224	Carbonic acid yields - - -	00000
0·154	Olefiant gas yields - - -	1898
0·114	Sulphuretted hydrogen yields - -	510
0·107	Hydrogen yields - - -	3713
0·044	Ammonia yields - - - -	267
100·000	Furnace-gases yield - -	110570 units of heat.

The numbers (II.) representing the units of heat are calculated from the data on the heat of combustion found in the posthumous papers of Dulong.

1 kilogramme, or 15,444 grains of	Carbon burning to CO, heats	15444 grains	of water to	1499°C.
	" " CO_2	"	"	7371°
	Carbonic oxide "	"	"	2502°
	Hydrogen	"	"	34706°
	Light carburetted hydrogen	"	"	13469°
	Olefiant gas	"	"	12322°
	Sulphuretted hydrogen	"	"	4476° *
	Ammonia	"	"	6060° *

The quantity of heat actually generated in the furnace during the escape of the unused 110,570 units of heat may be determined by the amount of nitrogen in the gases, which corresponds to the quantity of the air consumed during their escape. The amount of nitrogen found, viz. 64·126, corresponds to 83·29 of atmospheric air, which is able to effect the conversion of 14·367 carbon into carbonic oxide gas. Proceeding on the experiments of Dulong, the quantity of heat thus liberated will be 21,536°. Thus it follows that a furnace filled with Gasforth coal could realize in the most favorable conditions only 16·30 per cent. of its combustible material. The remainder, 83·70 per cent., escapes as unused but useful combustible matter. The practical use of these gases does not depend merely upon the quantity of heat generated during their combustion, but involves another equally important consideration, viz. the temperature capable of being attained by their use as fuel. This may be determined without any new experiments, by founding the calculation on the composition of the gas, its combustible value, and the capacity for heat of the products generated during combustion.

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* The ammonia and sulphuretted hydrogen are calculated from their constituents.

1 kil. of the gas gives, by its combustion, as we have already seen, 1105·7 units of heat. The products of combustion weigh 2·1385 kil.: and if this last quantity* consisted of water, the heat liberated would raise it to a temperature $\frac{1105\cdot7}{2\cdot1385}$. Now as the capacity of the heat of water is to that of the products of combustion as 1 : 0·2665, and the elevation of temperature produced in different bodies of equal weight, by equal quantities of heat, is in inverse proportion to their capacity for heat, we obtain, as the expression for the temperature of the mixture of gas burning with air, $\frac{1105\cdot7}{2\cdot1385\times0\cdot2665} = 1940^\circ$ C., or 3522° Fahr.

In these calculations we have neglected the influence exerted on the composition of the products of combustion by the gases escaping from the iron ore and limestone. Of course this must differ according to the quantities of materials used in the furnaces, and we therefore select as a basis for the calculation the iron furnaces of Alfreton, belonging to Mr. Oakes, the dimensions of which are given in fig. 6. We proceed on the supposition that the carbonic acid of the limestone and the oxygen of the ore are separated as carbonic acid. The coal used in the furnace was subjected to distillation with the precautions already described, and the composition thus obtained gives us the limits to which the combustible constituent of the gases from the furnace might be deteriorated under the most unfavorable conditions.

		grm.
1.	Weight of the coal used	25·7170
2.	" coke remaining	17·2894
3.	" gaseous and liquid products of distillation	8·4276
4.	" liquid products alone	5·7239
5.	Quantity of tar in the latter	2·4945
6.	" water	3·2294
7.	" chloride of platinum and ammonium from the latter	0·5428
8.	" sulphuretted hydrogen and carbonic acid	0·3574
9.	" sulphuret of lead formed	0·4530
10.	Weight of the condensed hydrocarbons	0·1321

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* In this, and also in other similar calculations, the small quantity of sulphuretted hydrogen has been left out of the calculation.

The eudiometric analysis of the uncondensed gases gave the following results:—

	Volume.	Temp.	Pressure.	1 m. at 0° C.
Gas used,	119·9	10° C.	0·4739	54·81
After admission of oxygen,	304·4	10	0·6542	192·11
After the explosion,	189·9	10	0·5335	97·73
After absorption of CO_2,	125·9	9·9	0·4801	58·33
After admission of hydrogen,	350·1	9·9	0·6850	231·44
After explosion,	129·2	10	0·4625	57·64

If we suppose that the very inconsiderable quantity of nitrogen found in the calculation (0·4) was an unavoidable impurity, we obtain, by the use of the formula 1, 2, 3, the following composition for the gas examined:

	According to volume.	According to weight.
Hydrogen	15·41	0·001377
Light carburetted hydrogen	34·63	0·024656
Carbonic oxide	4·76	0·005954
	54·81	0·031987

The 2·2142 carbonic oxide, carburetted hydrogen, and hydrogen, found in the analysis consist therefore of—

Light carburetted hydrogen	1·7067
Carbonic oxide	0·4122
Hydrogen	0·0953
	2·2142

Thus 100 parts of the coal were broken up into the following products:

Carbon	17·289	67·228
Tar	2·494	9·697
Water	3·188	12·397
Carburetted hydrogen	1·707	6·638
Carbonic oxide	0·412	1·602
Carbonic acid	0·293	1·139
Condensed hydrocarbons	0·132	0·513
Sulphuretted hydrogen	0·065	0·253
Hydrogen	0·095	0·370
Ammonia[*]	0·042	0·163
	25·717	100·000

The 67·228 carbon in the above analysis must escape altogether as carbonic oxide, if a part of it were not converted into carbonic acid at the expense of the oxygen of the iron ore. In order to determine the quantity of carbonic acid thus produced, we must refer to the details of the Alfreton iron works, in which the following materials are used for the production of 140 lbs. of pig iron:—

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[*] The ammonia escaping with the gases out of the condensed alcoholic water is neglected in this calculation.

420 lbs. calcined iron ore; 390 lbs. coal; 170 lbs. limestone.

According to the above experiment, 100 parts of the coal used give 67·228 of coke; but this quantity of coke does not correspond exactly to that of the carbonic oxide formed during its combustion. It is necessary, before calculating this, to deduct the amount of ashes contained in the coal, and the following analysis of the Furnace-coal of Alfreton gives us the data for the calculation:—

Carbon	74·83
Hydrogen	5·10
Oxygen	9·71
Nitrogen	0·18
Hygrometric water	7·50
Ashes	2·68
	100·00

As the 2·68 of ashes must be deducted from the 67·228 of coke, the latter corresponds to 64·548 of pure carbon. Part of this carbon, however, enters into combination with the iron, and is thus withdrawn from combustion. If we take, according to the analysis of Bromeis,* 3·3 per cent. as the average amount of carbon in cast iron, there must be 1·18 subtracted from the 64·548 of carbon, because the proportion of iron produced to coal used is 35·8 : 100. If we conceive the remainder 63·368 carbon to be burnt with air to carbonic oxide, we obtain as the product of combustion a mixture of—

Nitrogen	285·100
Carbonic oxide	147·858

Of this 147·858 carbonic oxide, part is converted into carbonic acid at the expense of the oxygen in the iron ore. The quantity of cast iron produced from 100 of coal is 35·8, and corresponds to 34·62 of pure iron, for the reduction of which 14·83 oxygen must have been given over to the carbonic oxide gas. By this means 25·952 of the latter would be converted into 40·782 of carbonic acid. The quantity of limestone added to 100 of coal is 43·59. This limestone consists, according to our analysis, of—

Lime	54·4
Carbonic acid	42·9
Magnesia	0·6
Alumina	0·8
Moisture and loss	1·3
	100·0

We must therefore introduce into the calculation, that 18·7 of carbonic acid are evolved from the limestone for every 100 parts of coal. By noticing all these observations the result is obtained, that 100 parts of coal thrown into the mouth of the furnace is reduced to 67·228 coke, by the loss of gaseous matter, and that this quantity, by passing into combustion when it has descended to the tuyère, produces a gas which, mixed with the nitrogen of the air and the carbonic acid from the limestone, passes back to the mouth of the furnace in the form of a gas consisting of—

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* Bromeis, Liebig's Ann. der Chem. B. xliii. S. 243.

Nitrogen	282·860
Carbonic acid	59·482
Carbonic oxide	121·906
	464·248

If this quantity be added to the products of distillation of 100 parts of coal, the following composition is obtained for the gases escaping from the furnace:—

	I. According to weight.	II. According to volume.
Nitrogen	59·559	60·907
Carbonic acid	12·765	8·370
Carbonic oxide	26·006	26·846
Light carburetted hydrogen	1·397	2·536
Hydrogen	0·078	1·126
Condensed hydrocarbons	0·108	0·112
Sulphuretted hydrogen	0·053	0·045
Ammonia	0·034	0·058
	100·000	100·000

From the numbers given in I. we may compare the proportion of the heat realized in the furnace during the process, with that which escapes in the form of useful combustible matter.

These are generated by the combustion of—

59·559	Nitrogen	0000
12·765	Carbonic acid	0000
26·006	Carbonic oxide	65067
1·397	Light carburetted hydrogen	18826
0·078	Hydrogen	2704
0·108	Olefiant gas	1331
0·053	Sulphuretted hydrogen	238
0·034	Ammonia	208
100·000		88374

And therefore out of 100 of the gases, 88,374 units of heat are generated.

The units of heat, 88,374, may be considered as the measure of the quantities of heat capable of being realized by the combustion of the furnace-gases. In order to find the proportion of the fuel actually realized in the furnace to that lost, we have only to calculate the units of heat produced in the furnace itself during the development of 100 parts of the furnace-gases. The only source of heat in the furnace is the oxidation of carbon, and this oxidation is effected at the cost of the air introduced by the blast, and that of the oxygen contained in the oxide of iron. Let us now consider the influence on the units of heat occasioned by the combustion of the carbonic oxide at the expense of oxygen in the oxide of iron. From the posthumous results of Dulong on the heat of combustion, it follows that the quantities of heat evolved by the combustion of 1 lit. (61·028 cubic inches) of oxygen with iron or with carbonic oxide is almost quite equal. The first gives 6216 and the latter 6260 units of heat. The trifling difference between these numbers is quite within the limits of error of observation, and therefore we may draw the conclusion, as Ebelmen has already done, that the reduction of the oxide of iron is without influence upon the development of heat in the furnace; for in the reduction of the oxide of iron at the cost of the carbonic oxide a thermo-neutrality takes place. Hence the combustion of the oxygen of the air is the only source of heat in the furnace. It suffices to determine the amount of oxygen which has accompanied the 59·559 nitrogen into the furnace in the form of atmospheric air, in order to fix the amount of heat generated. The carbonic oxide formed by the combustion of this oxygen is the only source of heat realized in the furnace, and corresponds, as will be seen in the following calculation, to 20,001. For every 20,001 units of heat realized in the furnace, 88,374 are lost by the gases which escape.

Hence follows the remarkable conclusion, that in the furnaces of Alfreton not less than 81·54 per cent. of the fuel is lost in the form of combustible matter still fit for use, and that only 18·46 per cent. of the whole fuel is realized in carrying out the processes in the furnace.

The maximum temperature which might be obtained by the combustion of the gases may easily be deduced by the following considerations. 1 kil. (15,444 grains) of the gas burned with atmospheric air gives 1·9338 kil. products of combustion, of the following composition and specific heat:—

Nitrogen - - - -	68·016	0·1859
Carbonic acid - - - -	29·896	0·0661
Aqueous vapor - - -	2·088	0.0176
	100·000	0·2696

If we divide the units of heat, viz. 883·74, arising from the combustion of 1 kil. of the gases, by the number resulting when the quantity of the products of combustion is multiplied by their specific heat, (1·9338 × 0·2696,) we obtain for the temperature of the flame 1695°·2 C., or 3083° Fahr. It is obvious that the gases escaping from the furnace must be of still more value as fuel than that expressed by our calculations founded upon their composition when of minimum value. They must be of a higher value, from the circumstance that the reaction of the liquid products of distillation on the red-hot coals produces a number of gaseous substances which must necessarily increase their value as fuel. The upper layers of coal, limestone, and iron, being cold, cause a condensation of the water and tar, both of which drop back upon the red-hot coals in the inferior layers, and become partly decomposed into hydrogen and carbonic oxide gas; whilst another part of the tar is broken up into hydrogen, light carburetted hydrogen, and charcoal. The portions escaping this decomposition are condensed anew by the cold layers above, and finally themselves suffer change. For the purpose of determining the influence exerted by this circumstance on the composition of the gases, we have repeated the experiment on the distillation of the coal, reversing, however, the mode of heating the tube;

we began at the front part instead of the closed end of the tube, so that the products of distillation might have to traverse the red-hot coals, and thus suffer a similar process of decomposition to that which they experience in iron furnaces. The ammonia in this experiment was collected in a Liebig's condenser filled with muriatic acid, and the gases were detained in a gasometer filled with boiled water. The determination of the other data necessary for the calculation was done as in the previous experiments, and the following results were obtained:—

Weight of the coal used - - - - - -	20·4550
" coke remaining - - - - - -	13·6568
" liquid and gaseous products of distillation	6·7982
" liquid products alone - - - -	3·5389
" chloride of platinum and ammonium obtained	0·7681
" sulphuretted hydrogen and carbonic acid -	0·5159
" sulphuret of lead - - - -	0·2500
" gases evolved - - - - - -	3·2593

The quantity of gas collected had the following composition:—

IN FIRST EUDIOMETER.

	Volume.	Pressure.	Temp.	1 m. at 0° C.
Original volume	116·2	0·6321	11°·0	70·61
After absorption of HC	111·9	0·6294	10·8	67·75
IN SECOND EUDIOMETER.				
Original volume	108·6	0·4441	11·1	46·35
After admission of O	282·1	0·6152	11·0	166·84
After explosion	193·8	0·5308	11·1	98·86
After absorption of CO_2	159·2	0·5040	10·4	77·30
After admission of H	383·5	0·7080	11·1	260·92
After explosion	75·4	0·4201	11·3	30·42

Hydrogen - - - -	51·32
Light carburetted hydrogen - -	28·28
Carbonic oxide - - -	16·35
Olefiant gas - - - -	4·05
	100·00

The 3·259 grms. of the gases obtained by distillation must therefore be composed as follows:—

Hydrogen - - - -	0·298
Light carburetted hydrogen - -	1·307
Carbonic oxide - - -	1·327
Olefiant gas - - - .	0·327
	3·259

100 parts of the coal distilled in this way gave—

Coke - - - - - -	13·657	65·123
Tar and water - - - - -	3·480	16·594
Light carburetted hydrogen -	1·307	6·233
Carbonic oxide - - - - -	1·327	6·328
Carbonic acid - - - - -	0·480	2·289
Olefiant gas - - - - - -	0·327	1·559
Sulphuretted hydrogen - -	0·036	0·172
Hydrogen . - - - - -	0·298	1·421
Ammonia - - - - - -	0·059	0·281
	20·971	100·000

This result, contrasted with that obtained when the coal was distilled so as to prevent the products of distillation passing over the red-hot coal, enables us to see clearly the influence exerted upon the tar and steam by the glowing fuel. The liquid products of distillation and the coke are diminished in quantity, and in their place we find an increase of carbonic oxide, olefiant gas, and hydrogen, arising from the carbon being oxidized at the expense of water, and from the decomposition of tar at an elevated temperature. Now if we calculate the composition of the furnace-gases from the principles now laid down, we obtain the following result:—

	I. According to weight.	II. According to volume.
Nitrogen - - - -	58.218	57·878
Carbonic acid - - -	15·415	9·823
Carbonic oxide - -	23·956	24·042
Light carburetted hydrogen -	1·555	2·743
Hydrogen - - -	0·354	4·972
Olefiant gas - - -	0·389	0·392
Sulphuretted hydrogen -	0·043	0·035
Ammonia - - - -	0·070	0·115
	100·000	100·000

The proportion of the substances in this mixture of gases may be viewed as the limits to which the quantity of combustible constituents may increase, when formed under the conditions such as those existing in the Alfreton iron works. We observe at the same time, that the increase of combustible materials effected by the reaction of the liquid products of distillation on the red-hot coal, principally depend upon the augmentation of hydrogen and olefiant gas. If we calculate from the above numbers, according to the principles already laid down, the quantity of heat evolved in the furnace by the formation of 100 parts by weight of the gases, and compare it with the heat which might be derived by the combustion of these gases themselves, we obtain the proportion 98,583 : 19,550, a result showing that in the Alfreton furnaces, under favorable circumstances, only 16·55 per cent. of fuel is realized; while 83·45 per cent. is actually lost by escaping in the form of inflammable gases.

1 kil. of the gas burnt with air gives 1·9290 kil. products of combustion, which consist of—

Nitrogen - - - - -	67·33
Carbonic acid - - - - -	29·83
Aqueous vapor - - - -	2·84
	100·00

The specific heat of the products of combustion calculated from this composition corresponds to 0·2740, from which it follows that the temperature of the flame of this gas burned with air would be 1768° C., or 3214° Fahr.

Thus then the temperature of the gases of the Alfreton furnaces is 3214° Fahr., when generated under conditions approaching to the favorable circumstances in the furnaces themselves.

(To be Continued.)

From the Boston Evening Traveler, May 16, 1849.

Report on the Explosion of a Locomotive Engine called the "Piscataqua," on the Eastern Railroad, on Monday the 2d day of April, 1849.

Read before the Boston Society of Civil Engineers, at a meeting held May 10th, 1849.

This engine was at work on a gravel train, and the explosion took place in the deep cut on Breed's Island, about two and a half miles from the depôt at East Boston.

The fireman, David Sullivan, was killed by the accident. John Innis, engineer, slightly injured. Engine entirely destroyed.

Description of the Engine.

This engine was of the class commonly termed 9-ton engines, and was built in Lowell, by the Locks and Canal Company, about ten years ago. It had been in ordinary use since it came upon the road. Two years ago it was entirely repaired, and the top of the fire box strengthened by the addition of heavier bridge bars. At this time, as nearly as your committee can learn, it was put in perfect repair. Since this, it has been repaired from time to time, as other engines are.

The following were the dimensions of the boiler: Waist length 7 feet, diameter 36 inches; tubes, 61 in number, 2 inches in diameter. Water spaces average between tubes $\frac{5}{10}$ths of an inch. Boiler was stayed lengthwise in the usual manner, by 6 long stay tubes, $\frac{3}{4}$-inch round iron. Thickness of the plates forming the waist of the boiler, $\frac{4}{16}$ of an inch; those forming fire box, $\frac{6}{16}$ of an inch thick. The rivetting of the plates, and connexions with the different parts, were in the manner and form commonly in use. It was supplied by two pumps of the common size, two safety valves, loaded by spring balances and levers to a pressure of 90 pounds to an inch when the balance was screwed down to its lowest mark of graduation. In general there was nothing unusual in the construction of the boiler, or in its apparatus for supplying water, all of which your committee believe to have been in good order.

The report of the master machinist in regard to this engine, was as follows:—"This engine was taken into the repair shop during the first week of January last. At that time, a pair of new wheels were put into the truck frame, the valves and valve-seats adjusted, and the working part of the engine examined and put into line; the dome was taken off, and new joints made. There was nothing done to the boiler, as there was no leakage at that time, nor since, except on the night of Tuesday, 27th March, when it came in *with one tube burst*, and I had both ends of that plugged up that night. On that night the safety valve was unscrewed to let off the steam quick. On the next Friday, 30th of March, I found the safety valve screwed clear down, so that the valve could not act without bending the lever. I unscrewed it at that time to the gauge of 90 lbs., and the steam immediately began to escape freely. On Saturday morning, the 31st of March, I went down with this engine to the Cut, to see about a slide of the bank which had come down the night before. It blew off steam freely at this time. I had found the safety valve of the engine screwed down before, and had spoken to the engine man about it when I found it down, and told him that I would not have a valve screwed down at any time, nor under any circumstances; and this is so understood by all. A safety valve screwed down will have the *appearance* of letting off steam gently, as the surfaces do not make a perfect joint after being used some time."

The work and repairs of this engine from the commencement of the year are as follows:—

	No. of miles run.	Cost of repairs.
January - -	1176	$177·58
February - -	1209	21·82
March - -	1275	18·76
Total -	3660	$218·16

Examination of the Engine after the Explosion, made in the yard of the machine shop at East Boston, April 3, 1849, 10 *o'clock, A. M.*

The wreck of the engine laid in three separate piles, where it was unloaded from the cars, having been removed from the place where it exploded.

The fire box and part of the lower plates of the waist laid in one parcel; the smoke arch and stack in another. The waist was torn entirely off from the smoke arch, at the angle. The pipes connected with it appeared to have been cut off with an axe, to clear away the wreck of the machine.

The fracture of the iron appeared dark in all parts. Three of the stay bolts were broken off close to the plate—fracture bright; (we learned that they were broken off after the explosion;) and three appeared to have been drawn out, the thread of the screw being torn off. The parts of the cylinders attached to this part of the engine were broken and twirled.

The waist was torn from the fire box at the angle, for about two-thirds of the circumference, the part attached being on the lower side, and was composed of the lower range of plates forming the bottom of the boiler. This was fractured and bent. It showed also some fractures which were evidently made by the falling of the engine after the explosion, being punched through from without. The fracture round the joining of the waist to the fire box was dark, as at the other end of the boiler; the fractures from without, above mentioned, were bright.

The crown of the fire box was stayed by a large bar, 2½ inches square, in the middle. Four smaller ones, two on each side, were bent down, but not factured.

Some of the small stay bolts connecting the forward plate of the fire box near the waist, were started off. The tubes were all taken away from the end of the boiler when it was removed. They had apparently been lengthened out at some time, the joining of the ends being about six inches from this tube plate, and the short ends remaining in the plate. The joints were lapped and brazed. Of the 61 tubes, in 57 of them the brazing appeared to have been melted, and the laps drawn apart. The other four were not melted apart, but showed the action of the fire, and had apparently been broken off after the explosion. The action of the fire could be seen in all the tubes, through a length of 18 inches from the tube-sheet, and no farther, the remainder of the length being coated with carbon, and the outside showing conclusively that they had been covered with water.

The appearance of these tubes, where they had been heated, was different from those in the "Taghconic," (the engine which exploded on the Providence Railroad,) in the absence of the lustrous scaled appearance which indicates the sudden application of water to heated copper.

The carbon was burned off from the inside of the furnace, and it appeared to have been heated, possibly by the fire remaining in the furnace after the explosion. The whole of the boiler appeared on this examination to have been unusually free from the collection of sediment commonly found in steam boilers in use on railroads.

In the third parcel were the remains of the working parts of the engine, the wheels, frame, and the top sheets of the boiler, in which the dome and safety valves were inserted.

The working parts of the engine were broken and twisted, and were in one mangled heap of fragments. The crank shaft broken at one of the journals, and in the wheel, which was of cast iron, every spoke was broken out. The part of the top plates of the boiler above mentioned, and which held the seats of both safety valves, consisted of the middle sheet nearly entire, and part of two others torn diagonally across. The fracture generally was of the same color as that at the parts before described (dark), and had the same appearance that it would have had if it had been heated and allowed to cool. The fracture followed sometimes the line of rivets, and sometimes across the sheet as before mentioned. The dome had been punched or cut, as it were, out of the plate in which it was inserted.

The fracture, not following the rivets, but following close to the cast iron flanch, had a bright appearance; but as it was thrown into the earth and covered with a wet clay, it may have received its bright appearance from this cause. The frame of the engine was much broken and twisted, and generally, with the exception of the fire box and smoke arch, and the cylinders contained in it, the engine was torn entirely to pieces.

The appearance of the boiler immediately after the explosion, before it was removed, taken from the statement of Mr. Farley, is as follows:

The engine, after the boiler burst, was laying parallel with the track about eight inches to the right of the rails, looking towards Boston; the tender was on the track, not injured; the waist of the boiler was gone from each end, except the bottom sheet, which was connected with the fire box by about 12 inches, leaving the tubes exposed to view. They were all in their places, except some five or six on the left side, which were found on that side. The fire box rested on the sleepers. The crank shaft broken at one end, and the spokes all broken out of the other wheel.

The four inside frames broken apart in the middle, and the outside framing bent out sideways. The smoke arch remained on the frame.—The sparker was about twenty feet distant, directly ahead. Three of the long stay bolts remained in their places, and three pulled out of the forward tube sheet and bent out sideways. The crown sheet of the fire box was bent down about one-half of an inch.

There was but little fire in the furnace when we got to the engine; not enough to cover the grate. This was sometime after the explosion. The fireman who was killed was found forward of the left hand driver, with his legs hanging over the frame, his face upward, and the back part of his head broken in.

Some of the heaviest parts of the engine were thrown a great distance by the explosion. The dome was thrown 375 feet; the boiler sheet 344 feet; and the bell 975 feet. The "cut" is deep, and the height where the dome was thrown is nearly 60 feet above the level of the rails. The hill falls off to the point where the bell was found.

Coroner's Inquest.

The evidence before the coroner's inquest was substantially as follows:

John Innis being sworn, testified as follows:—Have been running an engine on the Eastern Railroad two years. Am an engineer. I commenced running, about a week ago, the engine called "Piscataqua."—Started about 9½ this A. M. for Breed's Island; placed our cars and remained about 20 minutes to fill the cars with gravel. Told David Sullivan to fill the furnace with wood. Afterward stood by the side a few moments; then went and got upon the right hand side in my usual place when running. Then the said Sullivan remarked that there would soon be steam enough, when he stooped down and opened the furnace door and the boiler exploded. I had one foot on the tender, and the other on the engine platform. When I recovered, found Sullivan on the left side between the engine wheel and tender. Not sensible wholly. Heard Gandall say it was Sullivan. Was somewhat injured by the explosion. Sullivan was fireman at the time of the explosion. Had plenty of water in the boiler. Think the boiler to have been bad. The boiler was about 10 years old. Do not think it would have exploded unless there was some defect in it. Know of no cause for the explosion at this time more than at any other time. Was in the employ of the Eastern Railroad Company, both the engineer and myself; but if there was any defect in the engine, could not have known the fact. The explosion took place about 2½ miles from the depôt.

Samuel Gandall being sworn, testified as follows: Am conductor of the gravel train in the employ of the Eastern Railroad Company. Knew D. Sullivan. He was fireman. Was present, his back turned towards the engine at the time of the explosion. Saw nothing till I heard the explosion. Found Sullivan hanging by the legs on fragments, back downwards. Was the first to take hold of him. Considered him dead. No signs of life. Carried him out from the rubbish and laid him on the ground. Have known the engine nine or ten years. Known Sullivan two or three years. Should think him about 35 years old. Know of no reason why the accident should have happened to-day more than any other day.

Daniel Crowley being sworn, testified as follows: Have a contract with the Eastern Railroad to fill in gravel at East Boston. * * * Went in the first train. * * * Asked the engineer if he had plenty of water; he said he had. * * * Know of no reason for explosion unless from some defect in the boiler.

Dennis Nolan testified that he filled the boiler at 5½ A. M.—probably 4½ A. M. Saw a large quantity of water from the engine and tender at the time of the explosion.

From inquiries made at the station at East Boston, we ascertained that this engine was filled up and fired early by the watchman; that the tank was filled in the tender at 6½ A. M., containing about 500 gallons. This supply of water has commonly served to run four trips at the same work, or to run 21 miles with an ordinary load—only one-half of which work had been done at the time of the explosion.

Remarks and Conclusions.

Having stated the facts in this case as far as they have come to the knowledge of your committee, they submit the following remarks and conclusions for your consideration:—

The most remarkable fact is, that the engine exploded while at rest—no aperture open to agitate the water, nor pump at work injecting cold water, nor indication from the safety valves that the boiler was unduly loaded with steam. In most recorded cases of explosion, the accident occurred while the engine was in motion, or just started in motion. The appearance of the tubes and the testimony of the witnesses prove that the boiler was sufficiently supplied with water.

After a careful examination, we are of opinion that the explosion was not to be attributed to the weakness of any part of the boiler; but the effect was distributed generally over the whole waist; and that the dark color of the fracture was occasioned from oxidation produced by the heat of the contained steam.* All the parts fractured after the explosion were bright.

It is evident that the pressure of the contained steam was greater than the resistance of the boiler, and your committee are of opinion that the iron of which this boiler was constructed was as good as the average of iron in old boilers.

Taking the average strength of old boiler iron, as stated in the report of the Committee of the Franklin Institute, Vol. xx, page 107, at 50,000 lbs., and the formula $x=\frac{2\,P\,t}{D}$, x representing the pressure in pounds per square inch sufficient to burst the boiler; P strength of the iron = 50,000 lbs.; t the thickness = 0·24 inch; D the diameter of the boiler = 36 inches; and we have x = 666 lbs. per square inch; but as the method of constructing the boilers with rivets reduces this strength, we allow for the reduction, which gives the result of 456 lbs. per square inch, for the actual resistance of the boiler.

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* The discoloration of the surface of iron by different degrees of heat, taken from Rees' Encyclopedia, Fahrenheit's scale—article, Cutlery: 430°, slight color, inclining to yellow; 450°, pale straw color; 470°, yellow; 490°, brown; 510°, brown, with purple spots; 550°, bright blue.

Your committee are well aware of the difficulty of arriving at an exact conclusion as to the value of this resistance from this data, as there may have been some parts of the boiler weaker than the strength given by the formula; and were there not other circumstances beside the simple explosion to guide them, they might have doubted that there was so great a pressure of steam. But the fact that, after diligent examination, no parts of the boiler were found to indicate weakness or wearing away of the plates more than has been allowed for in the formula; the discolored appearance of the fracture, indicating a heat not less than 400° Fahrenheit; the heated appearance of the plates themselves, the great distance to which some of the parts were thrown—all indicate a great and undue pressure of steam in this boiler.

We therefore conclude, that at the time the explosion took place, this boiler was subjected to an internal pressure of steam of not much if any less than 450 lbs. to the square inch, and a temperature of 457°; and that this extraordinary pressure was occasioned by an accumulation of steam, in consequence of the safety valves being hindered in their free action.

Whether this obstruction was occasioned by carelessness, or by some defect in the construction of the balances, your committee are unable to state, as they had no evidence which could be conclusive in the matter. But from comparison with other balances, said to have been similar, it was evident that a very little carelessness in screwing down the lever would render the safety valve useless; and this carelessness or inadvertency, your committee are of opinion, was the cause of this explosion. They would therefore suggest the adoption of the practical rule, that when the safety valves are loaded by means of a lever and spring balance, they should be so constructed as to render it impossible to screw down the balance beyond the limit of pressure fixed by the builder or the superintendent of the engines.

Wm. P. Parrott, } *Committee.*
Simeon Borden, }

TRANSLATED FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

Historical Anecdote of Robert Fulton. By M. Andre Michaux.

Communicated to the Society for the Encouragement of National Industry, by M. De Lasteyrie, at their meeting of February 2d, 1849.

[*Note.*—M. Michaux is the distinguished botanist sent to this country by the French Government, whose work upon the Forest Trees of America is still the standard work upon that subject.—*Ed. Journ. Fr. Inst.*]

"The friends of science and the arts take always a lively interest in inquiring into and learning of even the least circumstances connected with great discoveries, especially with those which have exercised a remarkable influence upon the prosperity of nations generally.

"The employment of steam, applied first in manufactures, afterwards for the navigation of rivers, then upon the ocean, and finally upon railroads, may be considered as one of the most remarkable events in the nineteenth century.

"I propose to state one of the facts relative to this application, undertaken with the most entire success for the navigation of large rivers by Mr. Robert Fulton, which has most probably not been inserted in his biographical notice.

"Before the year 1806 I had already made two excursions to the United States of North America. On my return to France from my second voyage, I published an account of it under the title *Voyage à l'ouest des Monts Alleghanys, &c.* In 1806, I undertook a third under the auspices of M. le Duc de Gaëte, then Minister of Finance.

"In this last journey, I was instructed to visit all the forests which then covered this part of North America. After having, with this intention, traversed in all directions the Southern, Central, and Western States, I directed my course to the Eastern. In this latter excursion I was accompanied by one of my friends, a French officer, M. Parmentier, a native of l'Orient, who had served in the army of General Moreau, to whom he was greatly attached.

"When we arrived at Burlington, on Lake Champlain, I determined not to prosecute my researches any farther, but to return to New York. We started, in consequence, in a pirogue for Saratoga, where we arrived three days after our departure from Burlington. From this town we went by land to Albany, situated on the North River, and distant about 160 miles from New York. The relations, commercial and other, of all kinds, between these cities are very many and very frequent. At this time decked sailing vessels arrived and departed every day with twenty-five or thirty passengers. The passage generally took thirty-six or forty-eight hours, according as the wind or tide were more or less favorable.

"We had been three days at Albany, when the arrival from New York of a vessel propelled by steam was announced. This boat, which was decked, was about 25 metres (82 feet) long, and was commanded by the inventor, Mr. Robert Fulton. Many of the inhabitants of the city and strangers who were there at the time went to visit it; every one made his remarks upon the advantages consequent upon this new means of navigation, but also upon the serious accidents which might result from the explosion of the boiler.

"The vessel was lying alongside the wharf; a placard announced its return to New York for the next day but one, the 20th August, and that it would take passengers at the same price as the sailing vessels,—three dollars.

"So great was the fear of the explosion of the boiler, that no one except my companion and myself dared to take passage in it for New York.

"We quitted Albany on the 20th August, in the presence of a great number of spectators.

"Chancellor Livingston, whom we supposed to be one of the promoters of this new way of navigating rivers, was the only stranger with us; he quitted the boat in the afternoon to go to his country residence, which was upon the left bank of the river.

"From every point on the river whence the boat, announced by the smoke of its chimney, could be seen, we saw the inhabitants collect; they waved their handkerchiefs and hurraed for Fulton, whose passage they had probably noticed as he ascended the river.

"We arrived the next day between one and two o'clock at New York. We separated from Mr. Fulton after paying him the price of our passages.

"The day after our departure from Albany, and a few minutes after Chancellor Livingston had quitted us, Mr. Fulton expressed his surprise that, notwithstanding the number of persons who were going to New York, only two Frenchmen had had the courage to embark with him. In the course of the conversation, I informed him that M. Chaptal, then Minister of the Interior, had instructed me to examine the forests of this part of North America, and especially to study the trees which compose them, in reference to their employment in the useful arts. I told him that, on my return to Europe, I intended to publish a work upon this subject with plates. He approved of my project, adding that, in America, such a publication would be successful on account of its usefulness; that it would do me honor, and would be profitable to me; which has proved to be true.

"My companion and myself could not too warmly congratulate Mr. Fulton upon the complete success, not of his discovery, but of the application of steam to act thus powerfully against the wind and tide. With great kindness, he explained to us the mechanism of the machine, and how the impulse was given; he dwelt principally upon the incalculable advantages of this means for ascending the great rivers of the interior, particularly the Mississippi, navigable for a distance of more than 800 leagues, and of which the current has an extreme force and velocity.

"Upon my observing to him the difficulty which he would have to procure coal to heat his boiler, he said that he would replace it by wood; that the banks of the river were almost uninterruptedly covered with thick forests; that, in truth, this mode of heating would have the inconvenience of multiplying the stoppages, and increasing their length by the time necessary to fell the trees, cut them into proper lengths, and carry them on board of the vessel, etc. Do not, said I to him, let that disturb you at all. Last year, I crossed in several points the western parts of Virginia and Pennsylvania, situated between the Allegheny Mountains and the Ohio. The numerous and deep ravines cut by the streams which empty into that river exposed beds of bituminous coal, which lie at a depth of only two or three feet. This combustible is so easily procured that, although the whole country is covered with primitive forests, and consequently wood costs only the trouble of cutting the trees, the inhabitants (then it is true not numerous) found it more easy and less troublesome to go and get coal with a pickaxe and wheelbarrow; in short, that the abundance of this combustible, and the extreme ease of getting it were such, that it could be delivered at New Orleans, although the distance might be estimated at 800 leagues, at 10 francs per quintal. ($2 per cwt.) 'Your information,' said Mr. Fulton, 'is one of the most agreeable facts which I could hear; there can be no doubt of the incalculable advantages of the application of steam navigation to the interior of the United States; you, gentlemen, are the first persons who have dared to accompany me, and who are witnesses of the complete success obtained.'

"It appears that, at this time, Mr. Robert Fulton did not suspect that steam navigation might be one day applied upon the sea, and for traversing the ocean in much less time than with sailing vessels; he said nothing to us about it. I informed Mr. Fulton that I intended to return to France about the end of that year (1807). He then said that he had but lately returned thence; that, under his deep conviction of the importance of this application of steam to navigation, he had presented himself to the Ministers of the Navy and of War, that they might give him the means of making experiments, and finally to the Academy of Sciences of the Institute; that everywhere he had been well received, but that the first answer to him was always the want of money; that moreover the expansive force of steam was a thing long known, and that, as to the application which he proposed to make of it to navigation, its success was very doubtful, because very probably this force, powerful as it was, would not succeed in overcoming, at certain seasons of the year, the violence of the currents of rivers. This opinion was also expressed in a report made upon the subject to the Academy of Sciences, by the Minister of the Navy, Decrés. Rejected everywhere, Mr. Fulton returned to America. 'During my solicitations of the Ministers,' said he, 'I went to see M. Carnot. If, said he, I had still the honor to be Minister of War, I would not hesitate a moment to give you the means to make your experiment, the success of which is unquestionable, for I understand all the means of its action, and I foresee the immense results for the future. Since you are about to return to France,' added Mr. R. Fulton, 'have the goodness to call upon M. Carnot for me, and tell him that I shall never forget the kind reception which he gave me; tell him of the complete success of my efforts and my perseverance, of which you are the first witnesses; tell him that I shall always feel the deepest regret that France did not profit by my offers for the great enterprize which her government then meditated.'

"If we refer to this epoch, we find that the Emperor had resolved to make a descent upon England, and for that purpose had collected together an immense army at Boulogne, and had, to effect his debarcation, built a great number of vessels of all sizes. If, then, M. Carnot had still been Minister of War, and twenty steamboats had been constructed in a few months by Mr. Fulton, what might we not augur for the success of the enterprize? Then, without question, would France have become the first nation of the globe. Her power would have been lasting, for it would have had for its base the products of her agriculture, and not manufacturing industry, whose prosperity is always subject to events."

Bul. Soc. Enc. Nat. Ind. Sept. 1848.

On the Diurnal Variations of the Magnetic Needle, and the Aurora Borealis.

By M. AUGUSTE DE LA RIVE.

Extract of a Letter to M. ARAGO. Translated for the Journal of the Franklin Institute, from Annales de Chimie et de Physique, 3me serie, tom. xxv., p. 310.

Permit me to communicate to you, with the request that you will submit it to the Academy of Sciences, an extract from a memoir which I recently read before our Society of Physics and Natural History, upon the cause of the diurnal variation of the magnetic needle, and of the Aurora Borealis. In proceeding in the reference of these two classes of phenomena to the same cause, I have only followed the route which you yourself have traced; for more than thirty years ago, you, with indefatigable perseverance, established by your numerous observations the remarkable concordance which exists between the appearances of the Aurora Borealis and the disturbances of the magnetic needle.

The following is my theory; you will remark that it rests only upon well established facts, and solidly established principles of physical science. I had already, in 1836, in a notice upon hail, (*Bibliotheque Universelle, nouvelle serie, tom.* III. *p.* 217,) endeavored to prove that the atmospheric electricity owes its origin to the unequal distribution of temperature in the layers of the atmosphere. It is known that in a body of any kind, heated at one of its extremities and cooled at the other, the positive electricity passes from the warm toward the cold part, and the negative in the opposite direction; hence it follows that the lower extremity of an atmospheric column is constantly negative, and the upper end positive. This difference in the opposite electrical states must be greater in proportion as the difference of temperature itself is greater, and consequently more strongly marked in our latitudes in summer than in winter, and in general, more sensible in the equatorial than in the polar regions. It must be remarked that the negative condition of the lower portions of the atmospheric columns must communicate itself to the surface of the earth upon which they rest, while the positive state of the upper ends transmits itself from above downwards, along almost the whole length of each of the columns, according to the facility which the greater or less degree of moisture in the air presents for the propagation of the electricity. An atmospheric column is therefore like a pile of high tension, on account of the imperfect conductability of the elements of which it is composed; a pile, the negative pole of which, in constant and direct communication with the terrestrial globe, discharges itself into it, while it charges itself with electricity from its positive pole, which is distributed with an intensity decreasing as we depart from that pole; which explains why it is that the positive electricity increases in proportion as we rise in the atmosphere.

The causes which determine the accumulation of negative electricity at the surface of the earth, and that of the positive electricity in the upper regions of the atmosphere, act continuously; an unlimited tension of the two opposite electrical conditions ought to result, were it not that, when they reach a certain degree of energy, they neutralize each other by the effect of different circumstances. In other words, when they reach a certain limit of tension, which varies with the state of the atmosphere, and of the surface of the soil, the two electricities cannot pass this, and they recompose or neutralize each other beyond this limit. This neutralization is effected in two ways: in a constant or normal manner, and in an irregular or accidental manner.

This second mode presents itself under very varied forms; sometimes it is the mere moisture of the air, or better still, the rain or snow, which re-establish the electrical equilibrium between the earth and the atmosphere; in some cases tornadoes shew, in an energetic form, the mutual action of the two electricities tending to unite together. Sometimes the winds, by mixing the air in contact with the surface of the earth, and like it negative, with the positive air of the higher regions, give rise to heat lightnings or to storms when the formation of clouds and condensation of watery vapors from the effect of the moisture, and different temperatures of the strata of air which are mixed together, take place at the same time.

The attraction of the clouds by the mountains, and the luminous phenomena which shew themselves upon elevated points are also due to the same cause. But I will not dwell any longer upon all these natural and easily understood consequences of the theory which I am developing; I will confine myself to a single remark, that is, that in observations on the atmospheric electricity, we must take into consideration that the intensity of the electric signs perceived is not always a proof of the intensity of the electricity itself, for the moisture of the atmosphere, by favoring the propagation of the electricity of the upper strata, may, as we often see in winter, give rise to very energetic electrical manifestations, even when the cause which produces them is not very powerful. We frequently see the reverse in summer.

I pass to the regular and normal mode of neutralization of the two electricities. I already hinted at the existence of this mode in my notice of 1836, but I did not indicate it expressly, as I then wanted a datum which Science now possesses, to wit: the perfect conductibility of the globe, which the use of the electric telegraph has made known.

To explain clearly my conception of this mode of neutralization, I suppose the atmosphere divided into annular strata parallel to the equator; the positive electricity accumulated in the outer portion of the stratum, cannot exceed a certain degree of tension without passing through the rarified and much less moist air to the polar regions, where, finding an atmosphere saturated with moisture, it will re-unite easily with the negative electricity accumulated upon the earth. Thus we have the circuit formed; each annular stratum of the atmosphere gives rise to a current, which travels in the upper regions from the upper portion of the stratum towards the pole, re-descends towards the earth through the atmosphere around the pole, and returns by the surface of the globe, from the pole to the lower part of the stratum from which it started. These currents will be, therefore, more numerous and more concentrated in proportion as we approach nearer to the pole; and as they move always in the same direction: that is, from south to north in the upper part of the atmosphere, and from north to south at the surface of the earth, their effect will become more sensible as we leave the equator and approach the pole. But as the currents produced by the equatorial strata are individually stronger than those which come from strata more towards the north, the difference, although real, will nevertheless be less than we might at first believe. What takes place in our northern hemisphere must occur similarly in the southern hemisphere; the currents pass also from the equator to the pole in the upper regions of the air, and from the pole to the equator upon the surface of the earth. Consequently for an observer going from the north to the south pole, the current would move in the same direction with him from the north pole to the equator, and in a contrary direction from the equator to the south pole. I speak here of the current which moves along the surface of the earth. I must also remark, that the limit which separates the regions occupied by each of these two great currents is not, properly speaking, the equator, for it must be variable; it is, according to the theory which I am developing, that one of the parallels between the tropics which has the sun in its zenith, consequently it changes every day.

It is now easy to understand the cause of the diurnal variations of the magnetic needle. Conformably to the laws established by Ampere, the current which passes from the north pole to the equator ought to deflect the north pole of the needle to the west; this is what takes place in our hemisphere; and the current which passes from the south pole to the equator ought to deflect the north pole of the needle to the east; this is in fact what takes place in the southern hemisphere. The deviation at the same place ought to be greater in proportion as the difference of temperatures, and consequently of electric conditions, between the lower and upper strata of the atmosphere is greater; thus the deviation increases from the morning until 1h. 30m. P. M.; it is greatest in the months during which the sun is longest above the horizon, and is at its minimum in the winter months. Finally, these diurnal variations increase in amplitude in proportion as we leave the equator and approach the pole, a result still perfectly in accordance with what I have said of the increasing number of the currents towards the polar regions. In these regions, too, the variations may be very irregular, and perhaps null, if the magnetic needle be placed in situations where the electric currents traverse the atmosphere to reach the earth; in fact, a needle thus enveloped in currents on all sides is no longer affected, or at least is no longer affected in a regular manner. This remark may explain certain observations, particularly those made at Port Bowen, which appear to be anomalous.

I have been singularly struck, in examining very closely all the magnetic observations which I could obtain, and especially those of Colonel Sabine, by the remarkable manner in which they accord with the theory. I will cite but a single example: that is the very recent observations made at Saint Helena, which Colonel Sabine has just published. At Saint Helena the diurnal variation takes place towards the west so long as the sun is southward of the isle, towards the east as soon as the sun passes to the northward. In fact, in the first case, as I have remarked above, Saint Helena must be within the region in which the electric currents pass over the surface of the earth from the north pole to the equatorial regions; and in the second case in the region in which these currents go from the south pole to the equator. The hour of maximum diurnal variation is not the same for the island of Saint Helena as in continental countries, because the temperature of the surface of the ocean does not follow the same laws of diurnal variation as the temperature of the surface of the ground. Now the temperature of the lower stratum of the atmosphere must always be the same as that of the sea or land upon which it rests. This same circumstance explains certain apparent anomalies which the diurnal variations present in certain parts of the globe, as, for instance, at the Cape of Good Hope, which is surrounded on all sides by a vast expanse of ocean.

I desire it to be particularly remarked that, in what I have said, I have had reference only to the causes of perturbation of the direction of the magnetic needle, and by no means to the cause of that direction itself: that is, of terrestrial magnetism, the cause of which I by no means believe to be of the same nature, but in reference to which I do not at present speak. I content myself with considering the terrestrial globe as a large spherical magnet, and I study the external causes which may modify the direction which it, as a magnet, tends to impress upon magnetic needles.

What is the Aurora Borealis upon the theory which I thus propose? It is the luminous effect of the electric currents which pass in the upper regions of the atmosphere towards the north pole; the effect due to the union of certain circumstances which do not always present themselves in the same manner, nor at all seasons of the year. It is now well proven that the aurora borealis is an atmospheric phenomenon, as you long since suggested. The name *magnetic storm*, by which M. Humboldt designates it in his *Cosmos*, in fact suggests the same idea, which, moreover, the interesting details which he gives about this meteor confirm. The observations of Parry, Franklin, and especially the numerous and well made ones of MM. Bravais and Lottin, are also entirely favorable to this opinion, which, moreover, was the result of the observations of M. Biot, at the Shetland Islands.

This point being admitted, the following is the way in which I explain the production of the aurora borealis. When the sun, having passed into the southern hemisphere, no longer heats ours so much, the watery vapor which had accumulated during the summer in this part of the atmosphere begins to condense; the kind of moist cap which envelops the polar regions extends continually more and more, and facilitates the discharge of the electricity accumulated in the upper parts of the air. But in these high latitudes, and especially at this epoch of the year, the watery vapors must generally pass into the state of small particles of ice or snow floating in the air, like those which give rise to halos; they form, as it were, a kind of semi-transparent mist. Now these half frozen fogs conduct the electricity to the surface of the earth near the pole, and are themselves, at the same time, illuminated by these currents or electrical discharges. In fact, all the observers agree in stating that the aurora borealis is always preceded by a mist which rises from the pole, the edges of which, less dense than the rest, are first colored. Thus, also, it is more frequent near the pole in the winter months, and particularly in those during which there is much vapor in the air. In order that it may be visible at great distances from the pole, it is necessary (and it cannot often occur) that these clouds, composed of icy particles, should extend in an almost continuous manner from the polar regions to latitudes well to the southward. It is these same clouds which, when they are partial, which then frequently happens, give rise to halos.

Now the analogy noticed by almost all observers, between the mists which accompany the aurora borealis and those which produce halos, is a circumstance not a little remarkable. It is easy to verify, by direct experiment, the identity between the light of the aurora borealis and that which we obtain in passing a succession of electric discharges through rarefied air containing much moisture, and more particularly through a very thin stratum of snow or frost upon glass. I have satisfied myself that air much rarified, but perfectly dry, gives but feeble flashes, and that, in the experiment of the tube exhausted of air, it is essentially the moisture adhering to the inner walls of the tube which, by conducting the electric discharges, gives rise to the luminous effects. It is evident that the electric discharges transmitted by this kind of net-work of ice, must, when concentrated near the pole, determine there a light much more vivid than that which they develop when they are spread over a greater surface.

But why is it the magnetic and not the terrestrial pole which appears to be the cause of the phenomenon? The following is my answer: Let the pole of a strong electro-magnet be placed under a large surface of mercury; let the surface be made to communicate with the negative pole of a strong pile; let the point of a piece of charcoal communicating with the positive pole be approached to it; immediately the voltaic arc forms, and the mercury is seen to be agitated above the electro-magnet; wherever this is placed, the luminous currents turn around this pole, and from time to time throw out very brilliant rays. There is also, as in the case of the aurora borealis, an obscure part, in the form of a circular point above the pole of the magnet; this peculiar effect ceases, without any interruption of the voltaic light, when the electro-magnet ceases to be magnetized. With a continuous current of ordinary electricity, arriving at the pole of a powerful electro-magnet in rarefied and moist air, luminous effects are obtained which are still more similar in appearance to those of the aurora borealis.

These phenomena are the result of the action of magnets upon currents. Now the same effect must be produced by the magnetic pole of the earth; the neutralization of the two fluids probably takes place over quite a large extent of the polar regions, but the action of the magnetic pole determines the conducting fogs to turn around it, throwing out those brilliant rays, which, by the effect of perspective, appear to us to form the auroral crown. The sulphurous odor and the noise, which it is asserted sometimes accompany the aurora, will not be inexplicable; that odor would be due, like that which accompanies lightning, to that modification which the passage of electric discharges causes in the oxygen of the air, which M. Schönbein has called *ozone;* and as to the noise, it must be analagous to that which is produced, as I have shown, by the voltaic arc, when it is under the influence of a magnet very near it. If it takes place only very rarely in the aurora borealis, it is because it is very seldom that the luminous arc is sufficiently near the earth, and consequently to the pole. But the description of this noise, given by those who have heard it, is perfectly identical with that which I, without suspecting their analogy, gave of the noise which the voltaic arc gives under the action of magnetism.

The magnetic perturbations which constantly accompany the appearance of the aurora borealis are now very easily explained. This accidental recombination of a greater amount of the accumulated electricities must derange the normal action of the regular current; as to the direction of the perturbation, it will depend upon the part of the current which acts upon the needle, and consequently upon circumstances which it is impossible to predict beforehand, since they depend upon the extent of the phenomenon, and the position of the needle in reference to it. In fact, according as the horizontal plane in which the needle moves passes above or below the region in which the greatest activity of the phenomenon takes place, it will be either the current which travels upon the earth, or that in the air, (currents which pass in opposite directions,) which will act upon the needle;

even during the continuance of the same aurora, it may be at one time one, and at another time the other, of these currents which act. The variable directions in which the needle is deflected during an aurora borealis, accord very well with this explanation, at least so far as I have been able to judge from the different observations reported in the *Annales de Chimie*, and in different scientific travels. The remarkable effect which M. Matteucci has observed in the apparatus of the electric telegraph between Ravenna and Piso, during the magnificent aurora of the 17th November last, shews clearly the existence of a current circulating upon the surface of the earth, and which, rising by the telegraph wire, passed partly by this better conductor. The sounds which are given in certain meteorological circumstances by long iron wires stretched in a north and south direction, are clear evidence that they are traversed by a current which probably arises from those which circulate upon the surface of the earth, from north to south in our hemisphere. It would be very interesting to take advantage of telegraph wires having a direction more or less coincident with that of the declination of the needle, for the purpose of making, when they are not in use for their usual purposes, some observations to detect and measure the electric currents which probably traverse them; which would be easily done by completing the communication of these wires with the ground at one of their extremities, by means of a multiplying galvanometer. The comparison of results thus obtained, with those of simultaneous observations of the diurnal variations of the magnetic needle, would certainly present much interest, and might lead to meteorological conclusions of a remarkable kind.

I cannot terminate this extract without remarking that M. Arago had already, in 1820, a short time after the discovery of Œrsted, indicated the possibility of acting upon the voltaic arc by his magnet, and the analogy which might result between this phenomenon and that of the aurora borealis.

Translated for the Journal of the Franklin Institute.

Apparatus to preserve the Electric Light constant.

At the sitting of the Academy of Sciences of Paris, held on the 18th January, 1849, M. L. Foucault reminded the Academy that five years ago he had, together with M. Donnè, an apparatus in which the electric light was used in obtaining upon a screen a magnified image comparable with that given by the solar microscope itself. But in this instrument there was a great inconvenience arising from the necessity of continually watching and adjusting the charcoal points. This apparatus he has since modified so as not only to keep the poles, by a spontaneous action, at the same distance apart, but also to keep the radiant point immoveable. These results he obtains by the following arrangements: The two points are pressed together by springs, but cannot move in that direction without setting in motion a train of wheels, the last of which is controlled by an escapement. The current of the apparatus passes around an electro-magnet, the energy of which of course depends upon the intensity of the current; this electro-magnet acts upon a piece of soft iron, which is pressed in the opposite direction by a spring. Upon this soft iron is mounted the detent which checks the train of wheels before mentioned, and the direction of the movement is such, that when the current becomes stronger it presses upon the wheel-work, and when it becomes weaker, releases it. And as the current becomes stronger or weaker, according as the poles approximate to or recede from each other, it will be seen that the poles become free to approach each other as soon as their distance apart increases, but that they can never come in contact, because the increasing strength of the magnetism developed by their approach, presents an insurmountable obstacle, which removes itself as soon as the interpolar distance has again increased.

The approach of the charcoal points is therefore intermittent; but when the apparatus is in good adjustment, the periods of rest and movement succeed each other so rapidly as to be equivalent to a continuous progression.

M. Foucault states that he has been in possession of this apparatus for eleven months. He notices the very similar invention of Mr. Staite, and remarks that he does not wish to contest the merit of that gentleman's invention, but that he asks for a committee of the Academy to examine the condition of his apparatus, and the proof which he will adduce that the idea also originated with him, and was not copied from Mr. Staite. He also promises to show the committee a Bunsen (Carbon) battery, which can be put in action or taken apart in less than five minutes.

Upon this application the Academy appointed MM. Dumas and Regnault a committee, who at the next meeting (22d January,) reported that they had examined the apparatus of M. Foucault, and found it to work successfully, and that they are convinced, from the state of the apparatus, as well as from the certificates of the instrument makers, and the testimony of persons honorably known to the Academy, "that the means invented by Foucault originated with him, and were independent of those which Mr. Staite had also invented for the same purpose." They also reported that they had seen the galvanic battery so arranged as to be taken to pieces and put in action again in a few minutes.

Comptes Rendus de l'Academie des Sciences.

At the meeting of the 29th January, M. Gaigneau remarked that without suspecting the good faith of M. Foucault, he desired to inform the Academy that on the 14th of January, 1848, he had taken out, in the name of Mr. Wm. Petrie, of London, a patent for an apparatus which fulfilled the same conditions, in the same manner; and that the patent was not confined to this, but contained besides a method of producing an intermitting light for light houses, in which the period of intermittence could be regulated beforehand. He asked for a committee to report upon Mr. Petrie's discovery.

Translated for the Journal of the Franklin Institute.

Description of some Minerals from Brazil.

At the meeting of the Paris Academy of Sciences of 5th March, 1849, M. Dufrenoy exhibited to the Academy a specimen of a mineral from Brazil, which appears, as M. Elie de Beaumont remarked, to be to the diamond what emory is to corundrim. These specimens occurred among some recently furnished to the School of Mines, by M. Hoffman, a dealer in minerals; they came from Brazil, and were said to be hard enough to polish the diamond. In fact, their hardness was found to exceed that of the topaz. The singularity of this character induced M. Dufrenoy, Director of the School, to cause them to be analysed by M. Rivot, the head of the assay department of the School. The result of his examination was as follows:—

M. Rivot had at his disposition a large fragment weighing 65·76 grammes, (about 1000 grains,) and several small pieces weighing rather less than ½ gramme, (7·5 grains;) these last were alone analyzed. The larger piece seemed to have come from the same alluvium formation in which the diamonds of Brazil are found. Its edges were broken down by long friction, but it had not the appearance of a river pebble. It was of a slightly brownish black, dull; under the glass it appeared full of small cavities, separated by very small irregular lamellæ, slightly translucent and iridescent in the sun's light. The brown color was very unequally distributed throughout the specimen. Upon the face the cavities were arranged in lines which gave a fibrous appearance to it, as in the obsidian. It cuts glass easily, and scratches quartz and topaz. Its density, taken in distilled water at 12°, (53·6° Fah.,) was 3·012; the small pieces submitted to analysis presented the same aspect and the same hardness; their densities, taken at the same temperature, were found to be 3·141, 3·416, 3·255.

By a long calcination at a bright red heat, in a luted crucible, the specimens were not altered; they kept their aspect, hardness, and weight.—They contained, therefore, no matter volatile at that temperature out of contact of air.

They were analyzed by burning them in porcelain tubes, in a current of pure oxygen, according to the method used by M. Dumas. In the analysis of the first specimen, but a single potash tube was used, and a portion of the carbonic acid was consequently lost; in the other analysis this accident was guarded against by the addition of a second potash tube.

The following were the results of the analysis:—

	Ashes.	Carbon.	Sum.
1st specimen	2·03	96·84	98·87
2d "	0·24	99·73	99·97
3d "	0·27	99·10	99·37

The ashes were yellowish, and, in the first specimen, kept the form of the diamond. Examined under the microscope, they appeared to be composed of ferruginous clay and little transparent crystals, the form of which could not be determined.

L'Institut, 7th March, 1849.

The above evidently describes the same substance as that exhibited by Dr. Patterson at a meeting of the American Philosophical Society, on the 18th August, 1848, and thus referred to in their Proceedings. *(Vol.* v., *No.* 41, *p.* 33.)

"Dr. Patterson laid before the Society specimens of two minerals from the diamond mines of Brazil, received through Mr. Ernest Pailhet, a merchant of Paris, now in Philadelphia, by whom they were first introduced into commerce.

"One of these minerals occurs in irregular black lumps of considerable size, and is found in the diamond grounds one or two feet below the surface. It is considered a certain indication of the presence of diamonds, which, indeed, are sometimes found inside of its masses. Its structure is perfectly vitreous, and it appears to be a pure obsidian.

"The other, called 'Diamond Carbon,' or 'Black Diamond,' is found in the same locality. It cuts all other minerals, including the diamond itself, upon which it acts with as much rapidity as the diamond dust. The specific gravity of the smaller piece is 3·01. These minerals first attracted attention at the diamond mines, about six years ago. The 'Diamond Carbon' is sold here at 75 cents per carat of 3 1-6 grains troy, being about 25 cents per grain, or about six times the value of gold.

"Dr. P. conceives that the 'Diamond Carbon' will be found exceedingly useful in the arts, being applicable to all purposes for which diamond dust is now used."

Translated for the Journal of the Franklin Institute.

New Preparations for Cleaning Cast and Wrought Iron.

From the Minutes of the Managers of the Soc. for the Encouragement of National Industry.

M. Sorel, after recalling the labors of MM. Thomas and Delisse on the cleaning of metals *(See Jour. Fr. Inst., Vol.* XVI, *3d series, p.* 137,) observed that success in zincing or tinning wrought or cast iron depended, in a great measure, upon the cleaning, especially with cast iron. In fact, it may be conceived that if the acid exposes the carbon of the metal, it becomes impossible to make the tinning adhere. This is the reason why, up to this time, cast iron has not been tinned in the bath, notwithstanding the advantages of being able cheaply to tin cast iron culinary vessels.

M. Sorel has for a long time employed in his establishment for galvanizing iron, acids prepared by means of organic matters, such as, for example, diluted sulphuric acid, which has been used in the purification of lamp oil. This acid contains an oily matter which gives it the property of detaching and dissolving the oxide of iron without attacking the metal.

Finding, however, inconveniences in the employment of organic substances, M. Sorel examined whether, in the mineral kingdom, something better could not be had. He found that certain salts dissolved in acids replaced the organic matters with great advantage. The salts which gave him the best results are those of copper, antimony, and tin. He prefers to use the two former with muriatic acid slightly diluted with water, and the salts of tin with water acidulated with sulphuric acid.

The following are mixtures which he has used successfully:—

First Mixture.—Water acidulated with sulphuric acid, so as to mark 10° on the hydrometer at 59° Fah., 96 parts by weight.
Protomuriate of tin, 4 "

Second Mixture.—Add about 4 parts of a salt of copper to the above.

To clean wrought iron, more acid and less of the salts may be added, but for cast iron the modifications must be in the opposite direction. All the salts of copper are nearly equally efficacious.

The salts of tin also give good results with the other acids which are employed in cleaning iron, such as muriatic, but in a less degree than with the sulphuric.

Third Mixture.—Muriatic acid slightly diluted so as to mark about 15°, 98 parts.
Any salt of copper, (acetate, sulphate, nitrate, or chloride,) 2 parts.

These proportions may be modified; the quantity of the salt of copper may be increased, and another salt, such as sulphate of lead, zinc, iron, or others, but slightly soluble in muriatic acid, may be added; the hydrated oxide of iron and pyrolignite of iron answer well.

Hydrochloric acid diluted with water, in which a salt of copper has been dissolved, acquires, in a high degree, the important property of dissolving the oxide of iron, without attacking the metal. This compound has, besides, the advantage of cleaning in a few minutes.

It can be seen when the metal is attacked, 1st, by the disengagement of bubbles of gas; 2d, by a change in the appearance of the acid, which, from a slightly opaque olive, becomes limpid and blueish; 3d, by the precipitation of copper upon the iron. A little of the copper salt must then be added, which re-establishes it completely.

Bul. Soc. En. Nat. Indus., Dec. 1848.

Method of Soldering Cast Iron with Wrought Iron.

The following process has been recommended for this purpose:—First melt filings of soft cast iron with calcined borax in a crucible; then pulverize the black vitreous substance which is thereby produced, and sprinkle it over the parts which are intended to be united; after which, heat the pieces of cast and wrought iron, and weld them together on an anvil, using only gentle blows. This method is peculiarly applicable for the manufacture of iron articles which are intended to be made red-hot, and are required to be impervious to fluids or liquids; as such a result cannot be obtained by simple fastening.—[*Technologiste.* Lond. Journ. Arts, May, 1849.

Translated for the Journal of the Franklin Institute.

Experiments with the Light of the Voltaic Arc. *By* M. L. Foucault.

After describing his apparatus, (vide supra, p. 46,) M. Foucault thus proceeds: "We thus obtain arcs of all kinds which are persistent, and which can, bythe aid of lenses, be thrown upon a screen to contemplate their physical appearance, or upon a linear diaphragm, for the purpose of analysing them by the prism. A commutator is also used, to invert the direction of the current, for the purpose of shewing better the part of the action due to the positive and negative poles. This study, the end of which cannot yet be seen, has already given me the following results:—

The arc from charcoal points, which is certainly the most easily managed, furnishes by the prismatic analysis the most curious and brilliant appearance. Its spectrum is crossed, as is known, along its whole extent by a multitude of irregularly grouped luminous lines; but among these a double line is remarked, situated on the boundary between the yellow and the orange. This double ray recalling, by its form and position, the line D of the solar spectrum, I was desirous of examining whether it corresponded to it; for want of instruments to measure the angles, I had recourse to a peculiar process.

I projected upon the arc itself an image of the sun formed by a converging lens, which permitted me to observe at once the solar and electric spectra superposed. In this way I satisfied myself that the double bright line of the arc coincides exactly with the double black line of the solar light.

This process of investigation furnished me with the means of several unexpected observations. In the first place, it proved to me the extreme transparence of the arc, which but faintly shadowed the light of the sun. It shewed me that this arc, placed in the path of a beam of solar light, absorbed the rays D, so that this line of the solar spectrum is considerably strengthened when the two spectra are laid exactly over each other. When, on the contrary, they overlap, the line D appears blacker than usual in the solar light, and comes out more brilliant in the electric spectrum, so that we can easily judge of their perfect coincidence. Thus the arc offers to us a medium which itself emits the rays D, but at the same time absorbs them when they come from another source.

To make the experiment in a still more decisive way, I threw upon the arc the reflected image of one of the incandescent points of charcoal, which, like all bodies in ignition, gives no lines, and under these circumstances the line D appeared as in the solar light.

Passing then to the examination of the arcs furnished by other matters, I have almost always found the line D positive and at its place, and I have ascertained that it also coincides exactly with the brilliant line from the flame of a candle.

When the poles employed are of metals which give the ray D but feebly, such as iron and copper, it can always be revived with extraordinary intensity by touching them with potassa, soda, or one of the salts formed by lime, or by one of these bases.

Before concluding anything from the almost constant presence of the line D, it will without doubt be necessary to ascertain whether its appearance does not indicate the existence of the same substance mixed with all arc conductors. Nevertheless this phenomenon already appears to us a pressing invitation to the study of the spectra of the stars, for if, by good fortune, this same line should be discovered, stellar astronomy will certainly be able to make the discovery available.

I also endeavored to make these different arcs coincide, as in the case of that of carbon with the solar light, and under these circumstances I was again struck with the appearance of unexpected phenomena. During the coincidences of these various spectra, I saw the electric lines stand out upon the comparatively uniform ground of the solar spectrum, so that it might be seen that, notwithstanding their apparently accidental grouping, they all possessed the tint of color corresponding to their refrangibility. This determination can be made with certainty, since the standard of comparison is not far off.

But what is peculiarly striking in this experiment is, that among these electric lines there are some which possess an intensity absolutely enormously superior to that of the corresponding solar ray. Especially in the arc from silver there is a green ray, so to speak, inextensible by the prisms, and of a dazzling splendor. It is a true source of simple light, and as it is insulated, and as the arc from silver is transparent, tranquil, and durable, there is nothing to prevent this ray from being made the source of a green light as intense as may be wanted; and from being utilized for the demonstration of phenomena heretofore indicated by theory alone. Photography will furnish the means of measuring the extreme intensity of this beautiful ray, of which, without doubt, the calorific action may also be established.

Other very intense rays have also their fixed places in different parts of these spectra, and even at their extremities, and there are great probabilities of discovering isolated lines, the rays corresponding to which cannot be seen in the solar light. L'Institut, 7th Feb. 1849.

Transportation of Solids by the Voltaic Arc.

M. Maas, Professor of Physics in the College de la Paix, at Namur, gave an account to the Academy of Sciences at Brussels, (4th November, 1848,) of an experiment which he thinks shews that, contrary to the usually received opinion, the transportation of the material of the electrodes is not always from the positive to the negative, but that the direction of motion depends upon the nature of the electrodes, and may be from the negative to the positive. This experiment was made at first with a Grove battery of 70 very small elements, the anode being a cylinder of very hard and fine-grained coke, while the kathode was a similar cylinder of a larger grain. "Whilst the pile was in operation, I remarked that the incandescent particles were thrown from the negative pole, not towards the positive, but in a direction which oscillated around a plane at right angles to the arc. The current being suspended, I found that the positive pole was only a little blunted, while the negative presented a kind of interior button, surrounded by a crown more raised than the rest, which the arc coming from the positive pole had avoided." The experiment was then repeated with another Grove battery of 15 larger couples, in order to satisfy the experimenter that the effect did not depend upon the peculiarity of the battery. He finally cites other experiments of Pouillet and Ermann, which he thinks lead to the same view.

But does his experiment prove anything, except that the current passes in preference by the more compact carbon, and that the irregular grain causes the material to fly, as is well known to be the case before the blowpipe?—*Ed. Journ. Fr. Inst.*

Statistics of Bookbinding in London.

Some idea may be formed of the extent of the London bookbinding trade from calculations which have been made, to the effect, that the weekly consumption of leaf gold, for enriching the exterior of books, amounts to about 3,600,000 square inches; and that 350 tons of paper shavings from book edges are sold annually by the London binders.

Lond. Builder, June, 1849.

Translated for the Journal of the Franklin Institute.

Analysis of Bran. Test for Albumen, &c.

M. Meller gives the following as the proximate analysis of a bran from a native wheat grown in the north of France in 1848.

Starch, dextrine, and sugar,	53·0
Liquorice sugar,	1·0
Gluten,	14·9
Fatty matters,	3·6
Lignin, (*woody fibre*,)	9·7
Salts,	0·5
Water,	13·9
Incrusting matters and aromatic principles,	3·4 (by difference.)
	100.

EXTRACTS FROM PROCEEDINGS OF THE PARIS ACADEMY OF SCIENCES.

Translated for the Journal of the Franklin Institute.

A new process for transforming common Salt into Sulphate of Soda, by means of the Sulphate of Iron. Presented by MM. Emile Thomas, Dellisse and Boucard, *Civil Engineers. February* 5, 1849.

This process allows the very economical use of iron pyrites on one hand, and of the water of salt springs or of the ocean on the other.

The dry sulphate of soda is stated to cost only from one-fifth to one-seventh of its former price. Besides which, the new process avoids all the inconveniences arising from the discharge of the vapors of muriatic acid.

A process of this kind might be very useful over an extensive region of our country, where salt springs abound, while the rocks are filled with iron pyrites. From the sulphate, the carbonate and other salts of soda are made by well known processes.

Use of Anæsthetic agents during Surgical Operations.

Stanislas Julien has found, in examining the Chinese books in the National Library at Paris, the proof that the Chinese have been long acquainted with the use of anæsthetic agents during surgical operations. The extract which he gives is from a book published about the commencement of the sixteenth century, in fifty volumes quarto, and entitled, "*Kou-kin-i-tong. General account of ancient and modern Medicine;*" and refers to the practice of a celebrated physician—Ho-a-tho—who flourished between the years 220 and 230 of our era. It states that when about to perform certain painful operations, "he gave the patient a preparation of hemp," (Hachich,) and that at the end of a few moments "he became as insensible as if he had been drunk or deprived of life." After a certain number of days, the patient was cured without having experienced the slightest pain during the operation. In a subsequent notice he also shows that the same physician used the hydropathic system as a cure for certain diseases, among others, chronic rheumatism.

Ground Nuts as a substitute for the Potato.

M. A. Richard, in a communication read at the meeting of the 12th February, 1849, recommended to the attention of cultivators the tubercles of our ground nut (*Apios tuberosa*,) as a substitute for the potato. He gives a minute account of the plant and its mode of culture, and states its advantages as follows.

First. Its chemical composition and sweet and agreeable taste have a strong analogy to those of the potato.

Secondly. They contain nearly twice as much nutritive matter as an equal weight of potatoes. (The numbers given by the analysis are 42·4 for the ground nut, and 25·6 for the potato.)

Thirdly. It resists the severest colds, and its culture will therefore be easy in France, which culture he thinks should be encouraged as an important resource in case the potatoes should fail entirely.

On the use of the fibres of the Banana tree in the manufacture of Paper.

A report made at the same meeting, by M. Payen, on behalf of a committee composed of himself and MM. Pouillet and Boussingault, speaks in high terms of the proposition of M. Roques to introduce the fibre of the banana tree into the manufacture of paper. This tree is grown extensively in the West Indies as a protection to the coffee plant, and as furnishing by its fruit sustenance for the slaves. In collecting the fruit the tree is cut down, and little or no use has hitherto been made of the stems. According to the report, the introduction of this fibre into paper has the advantage of giving, by a cheap material, which can be procured in great abundance, a greater strength to the paper, and of requiring less sizing, while the experiments made upon a large scale show that it presents no disadvantages in regard to the quality or color of the paper.

On the effect of Lightning.

In reference to a former communication on the subject of the effects of lightning, M. Miner states on the authority of M. Durant, a forest guard, well known for his integrity and observation, that he (M. Durant,) had remarked in his inspections that the trees struck by lightning were generally the largest and most leafy; but that sometimes the case was different. He states that upon one occasion, upon the edge of the forest of Ardennes, he had seen a poplar tree furnished with young branches along its whole trunk, struck by the lightning, which spared neighboring trees which were considerably higher, but had recently been trimmed. The same stroke killed an old man who was reading the Bible in his cottage, which was in the vicinity of the tree; and on the next morning a number of fishes in a neighboring pond, were found floating dead.

Upon the apparent diameter of the Sun.

At the meeting of the 19th February, M. Faye, in a very interesting communication upon the different estimates of the apparent diameter of the sun, recommends the Daguerreotype as a means of obtaining a very close approximation to the true value. The diameter of the image being measured micrometrically, and the focal distance of the object glass being determined by the method which Bessell applied to the Fraunhofer heliometer. If an error of half a millimetre (0·02 in.) was made in the focal distance, and one of 0·005 mim. in the diameter of the image, the error of the determination, except from accidental and atmospheric causes, would be only 0·″14. He also recommends the same process for other similar determinations, and takes occasion to notice with admiration the application, upon our Coast Survey, of the electric telegraph to the determination of the differences of longitudes.

Notice of a Meteorological Phenomenon.

A second communication from M. Faye is in the following terms: "I observed to-night a phenomenon to which I call the attention of persons who interest themselves in meteorological optics. In coming out from a room which opens into the back of the observatory, I observed that the light of a gas lamp placed in the room some four or five yards behind me, produced in front of me, through the open door, a white rainbow like a lunar halo, the lower half of which was thrown upon the ground and the neighboring bushes. I measured roughly the angle subtended by the diameter of this circle, by means of two crossed rulers, and I found it to be between 80° and 90°—nearer 80°. As I was making arrangements to study this appearance more closely, by varying the light and the position of the lamp, the fog was nearly dissipated by a light west wind. This white bow ought to be easily re-produced during fogs, and where the nature of the vesicles of the fog will permit, it might be produced by means of the electric light, and thus studied more completely than I did."

Experiment upon the diameters of Newton's Rings.

MM. F. de la Provostaye and P. Desains, communicated some experiments upon the diameters of Newton's rings. Newton, in observing these rings under the different incidences of the light, was led to the supposition that the thicknesses of the thin sheets of air corresponding successively to a ring of the same order, varied as the secant of an angle u, such that

$$\sin.\ u = \frac{\left(105 + \frac{1}{n}\right)}{106} \sin.\ r.$$

Where n is the index of refraction of the glass, and r the angle which in the thin plate the ray of light makes with the normal.

As long as r is less than 60°, the numerical value of *secant* u does not differ sensibly from that of *secant* r, but when r exceeds this value, *sec.* u is less than *sec.* r, and above the value of $r = 80°$, the difference becomes considerable.

According to the undulatory theory, the thicknesses at all incidences ought to be proportional to *sec.* r. Fresnel and Herschel examined this difference, which according to the latter presents a serious objection to the undulatory theory. To explain it, they admitted the possibility of the law of Descartes being inaccurate in the very oblique passage of rays between two surfaces close to each other.

By their experiments, MM. Provostaye and Desains show that the deductions of Newton were erroneous, and that the theoretic law accords perfectly with experiment up to the highest limits at which the rings could be clearly seen. This limit is 85° 21′.

On the production of Anhydrous Nitric Acid.

At the same meeting a note was read from M. H. Deville, "on the production of anhydrous nitric acid." The following is the principal part of this interesting communication:

"In treating the nitrate of silver by absolutely dry chlorine, I have succeeded in isolating the anhydrous nitric acid, the existence of which has been demonstrated by numerous analyses. This beautiful substance appears in the form of colorless crystals of great brilliancy and limpidity, which may acquire considerable size. When they are slowly deposited in a current of strongly cooled gas, their edges may acquire a length of a centimetre, (four-tenths of an inch.) The atmosphere in which the anhydrous nitric acid exists in the state of vapor, and mixed with carbonic acid, may be perfectly colorless, but at the moment when the tube is closed by the blowpipe, there is developed a small proportion of hyponitric acid, which gives the gas a faint reddish tint. This has happened in the tube enclosing the specimen which I have the honor of submitting to the Academy."

"The anhydrous nitric acid crystalises in six sided prisms, which appear to be derived from a right prism with rhombic base. (larger crystals will in a short time allow me to determine exactly their form.) It melts at a temperature which does not much exceed 29° 5′ (85° Fahr.) and boils at about 45° (113° Fahr.) Its tension at 10° (50° Fahr.) is very considerable."

"The analysis of this body presents some difficulty owing to its tension, which produces, the moment the bulb is broken, a rapid disengagement of gas. Very soon the copper absorbs the vapors with such rapidity that there is a sudden absorption and deformation of the green glass tube in which the experiment was made. Nevertheless, by taking great precaution, I have succeeded in determining numbers which leave me no doubt."

"I have also succeeded in fixing the capacity of saturation, which corresponds to the formula $Az\,O_5$."

"Anhydrous nitric acid heats very much in contact with water, and dissolves without coloration, and without disengaging any gas; it then produces, with baryta, the nitrate of baryta, easily recognizable by its crystalline form."

"The decomposition of nitric acid, under the influence of heat, appears to begin nearly at its boiling temperature. This is an obstacle to the determination of the density of its vapor by the process of M. Dumas. I endeavored to reach this determination by a method which, however, presents the inconvenience of giving numbers depending upon a temperature too near the point of ebullition."

"The process by means of which I obtain the anhydrous nitric acid, is very simple; but the ease with which this body penetrates caoutchouc tubes, renders it necessary to connect all the pieces of the apparatus by welding. I employ an U tube, capable of containing 500 grammes (7500 grains,) of nitrate of silver, dried in the apparatus itself at a temperature of 180°, (356° Fahr.) in a current of dry carbonic acid gas. To this tube is welded another U tube of a very large diameter, and provided at its lower part with a small spherical reservoir welded on to it. Into this reservoir will pass a liquid which is always developed during the operation, and is excessively volatile—(nitrous acid?) The nitrate of silver tube is plunged into water covered with a thin layer of oil, and heated by means of an alcohol lamp communicating with a reservoir in which the alcohol is kept at a constant level. The chlorine passes out from a glass gasometer, and its displacement is caused by a slow and constant flow of concentrated sulphuric acid. The chlorine must pass over chloride of calcium, and then over pumice moistened with sulphuric acid. At ordinary temperatures, no effect seems to be produced. The nitrate of silver must be first heated to 95°, (203° Fahr.) and then rapidly cooled down to 58° or 60°, (136° or 140° Fahr.) which temperature must not afterward be exceeded. During the first moments, hyponitric acid, recognisable by its color and its easy condensation, is developed; then when the temperature has reached the lowest point which I have assigned, the production of the crystals begins, and they will soon have obstructed the recipient, which is to be cooled to —21°, (—6° Fahr.) They are always deposited upon the part of the recipient which is not immersed in the freezing mixture, and I have found that ice alone is sufficient to determine their appearance. The gases are colored, and the little sphere of the cooled tube contains a small quantity of liquid, which must be removed from the apparatus before the nitric acid is transferred. This latter operation is easily performed by replacing the current of chlorine by one of carbonic acid. The cooling of the condenser is then stopped, and the bulb intended to receive the crystals, which is fastened to the apparatus for their production, by means of a caoutchouc tube lined with asbestos, is plunged into the freezing mixture."

"The chlorine must pass very slowly, not more than from three to four litres (*quarts*) in twenty-four hours. Nevertheless, all the gas is not absorbed by the nitrate of silver; oxygen is developed. An apparatus thus arranged will work night and day without superintendence. Only from time to time the sulphuric acid which displaces the chlorine, the alcohol which furnishes the lamp, and the materials of the freezing mixture, must be renewed."

"I will have the honor soon of submitting to the Academy a more complete memoir, in which will be found described the chemical properties of anhydrous nitric acid, and in which I will record the result of the examination which I am pursuing of the action of chlorine and of hypochlorous acid upon the salts of silver."

On the manufacture of Gun Cotton.

M. A. Gaudin communicated some remarks upon gun cotton, in which he endeavored to account for the very different results which experimenters had obtained from it. He thinks that there are an infinite number of intermediate products of the method of manufacture, from the product which merely burns, to that which fulminates. The product which burns slowly is obtained by immersing the cotton in concentrated sulphuric acid mixed with saltpetre, while the fulminating compound results from cotton immersed in a mixture of monohydrated nitric acid mixed with Nordhausen sulphuric acid, and the formation of this latter product appears moreover to be instantaneous.

If it appears that this latter supposition is true, then all specimens prepared upon any thing like a large scale, must be composed of a series of various products of different degrees of energy. The part first moistened may be the most energetic, and that which was first wet being able to burn only.

He also believes that the spontaneous explosions which have occurred from it, are due always to insufficient washing.

(His suggestions as to the instantaneous formation of the fulminating cotton, and the cause of its spontaneous explosions, may be correct, but he is decidedly in error as to the nature of the compound made by immersing the cotton in sulphuric acid and nitre. With the proper precautions a very excellent gun cotton may be prepared in this way.)

AMERICAN PATENTS.

Bain and Morse's Telegraphs.

Decision of Judge Cranch in the case of Alexander Bain, Appellant, *vs.* Samuel T. B. Morse, Appellee.

From the Daily Union, April 5, 1849.

Upon the question of interfering applications for a patent:

The Commissioner, upon hearing, decided that Mr. Bain's claim interfered with Mr. Morse's, and that Mr. Morse was the first inventor; and rejected the claim of Mr. Bain. From this decision Mr. Bain has appealed.

It is contended by the counsel for Mr. Morse, that the judge upon appeal has no jurisdiction of the question of interference,—that an appeal is given only upon the question of *priority of invention;* and that upon the question of interference the decision of the Commissioner is conclusive.

Whether it be thus conclusive, then, is the first question to be decided.

By the act of 1836, ch. 357, sec. 7, it is enacted, that "if the specification and claim shall not have been so modified as, *in the opinion of the Commissioner*, shall entitle the applicant to a patent, he may, on an appeal, and upon request in writing, have the decision of a board of examiners, to be composed of three, &c.: and on examination and consideration of the matter by such board, it shall be in their power, or of a majority of them, to reverse the decision of the Commissioner, either in whole or in part; and their opinion being certified to the Commissioner, he shall be governed thereby in the further proceedings to be had on such application."

This section is applicable to cases where there is no conflicting applicant, and shows that the legislature, by saying, "*if in the opinion of the Commissioner*," &c., did not intend to make that opinion conclusive. On the contrary, it provides "that the board shall be furnished with a certificate, in writing, of the opinion and decision of the Commissioner, stating the particular grounds of his objection, and the part or parts of the invention which he considers as not entitled to be patented; and that the said board shall give reasonable notice to the applicant, as well as to the Commissioner, of the time and place of their meeting," &c. All these provisions were evidently intended to enable the board of examiners to revise the opinion and decision of the Commissioner, and show that his opinion was not to be conclusive.

By the 8th section of the same act, (1836,) it is enacted, "That wherever an application shall be made for a patent which, *in the opinion of the Commissioner*, would interfere with any other patent for which an application may be pending, or with any unexpired patent which shall have been granted, it shall be the duty of the Commissioner to give notice *thereof* to such applicants, or patentees, as the case may be; and if either shall be dissatisfied with the decision of the Commissioner on the question of *priority* of right or invention on a hearing thereof, he may appeal from such decision, on the like terms and conditions as are provided in the preceding section of this act; and the like proceeding shall be had, to determine which, or whether either, of the applicants is entitled to receive a patent as prayed for."

The question of priority of right or invention necessarily implies *interference.* The Commissioner, before he could decide the question of priority, must have decided that of interference; for without interference there can be no question of priority. Before I can have jurisdiction of the question of priority, I must be satisfied that there is an interference; and I must decide the question of jurisdiction as well as any other question which arises in the cause.

The opinion of the Commissioner, (mentioned in the 8th section,) that interference exists, only justifies him in *giving notice thereof* to the other applicant, and appointing a day to hear the parties upon that question.—He decides it only *pro hoc vice*, and for that purpose only. Upon that hearing he is to decide; and from that decision, if either shall be dissatisfied with it, on the question of priority, including that of interference, he may appeal; and upon such appeal, as I understand the law, the judge, in case of real interference, may "determine which, or whether either, of the applicants is entitled to receive a patent as prayed for." The scope thus given to the judge is broad enough to include the question of interference as well as that of priority, if it should arise.

By the act of 1836, ch. 88, sec. 11, it is enacted, "That in all cases where an appeal is now allowed by law from the decision of the Commissioner of Patents, to a board of examiners provided for in the 7th section of the act to which this is additional, the party, instead thereof, shall have a right to appeal to the Chief Justice of the District Court of the United States for the District of Columbia, by giving notice thereof to the Commissioner, and filing in the Patent Office, within such time as the Commissioner shall appoint, his reasons of appeal specifically set forth in writing; and also paying into the Patent Office, to the credit of the Patent Fund, the sum of twenty-five dollars.

"And it shall be the duty of the said Chief Justice, on petition, to hear and determine all such appeals, and to revise such decisions, in a summary way, on the evidence adduced before such a Commissioner, at such early and convenient time as he may appoint, first notifying the Commissioner of the time and place of hearing, whose duty it shall be to give notice thereof to all parties who appear to be interested therein, in such manner as the said judge shall prescribe.

"The commissioner shall also lay before the said judge all the original papers and evidence in the case, together *with the grounds of his decision*, fully set forth in writing, *touching all the points involved by the reasons of appeal*, to which the revision shall be confined."

One of the reasons of appeal in this case is, that there is no real or substantial interference between the two applications.

The question of interference, therefore, is involved by the reasons of appeal, and must be decided by the judge. By limiting the jurisdiction of the judge to the points involved by the reasons of appeal, the legislature has affirmed it to that extent.

The interference mentioned in the 8th section of the act of 1836, must be an interference in respect to patentable matters; and the claims of the applicants must be limited to the matters specifically set forth as their respective inventions; and what is not thus claimed, may, for the purpose of this preliminary inquiry, be considered as disclaimed.

The question then is, does Mr. Bain claim a patent for any matter now patentable for which Mr. Morse claims a patent?

To answer this question, it is necessary to ascertain for what patentable matter Mr. Morse now claims a patent.

In his specification, filed January 20, 1848, he says: "What I claim, as my own invention and improvement, is the use of a single circuit of conductors *for* the marking of my telegraphic signs already patented, for numerals, letters, words, and sentences, by means of the decomposing, coloring, or bleaching effects of electricity, acting upon any known salts that leave a mark as the result of the said decomposition, upon paper, cloth, metal, or other convenient and known markable material. I also claim the invention of the machinery as herein described, for the purpose of applying the decomposing, coloring, or bleaching effects of electricity acting upon known salts as herein before described."

The Commissioner, in his written decision in this case, says: "Such use of a single circuit [i. e. to produce marks upon chemically prepared paper] is not the point at issue; *nor is this claimed by either party.* Said Morse claims using a single circuit of conductors for a certain purpose, or in a certain way, viz: to mark his telegraphic signs; and also claims the machinery by which he accomplishes this purpose. Said Bain does not specifically mention in his claim using a single circuit, though this must be considered an essential part of his invention and claim, and is necessarily involved in the final clause of his claim, to wit: 'So that in either case these form the *received communication*, substantially in the manner and with the effects described and shown.'"

The Commissioner proceeds: The third clause of the claim of said Bain, with which the true claims of said Morse interfere, is as follows, to wit:

"Third, The application of any suitable chemically prepared paper, without regard to the chemical ingredients used for such a purpose, to receive and record signs forming such communications—such signs being made by the pulsations of an electric current or currents, transmitted from a distant station, said currents operating directly, and without the intervention of any secondary current or mechanical contrivance, through a suitable metal marking style that is in continuous contact with the receiving paper, thereby making marks thereon; which marks correspond with the groups of perforations in the paper *composing* the transmitted communication; or may be given by the pulsations from the spring 45 and block 46; so that in either case these form the received communication substantially in the manner and with the effects described and shown, including any merely practical variations, analogous and equivalent in the means employed, and the effects produced thereby."

The Commissioner, in his written decision, says:

"The invention, it will be seen by reference to the specifications of the parties respectively, does not consist in the use of the electric current to make marks upon chemically prepared paper; nor making marks through a single line of conductors; nor could a claim to either of these devices have been entertained as patentable, as they have been long known."

Again: It is said by the counsel of Mr. Morse, "it is admitted that neither could patent the *battery*, the *circuit*, the prepared paper, or the marking by the electro-chemical process—it was only a *new combination* of the several parts so as to produce a new result, *or an old result in a better manner*, that either could patent."

Again: The Commissioner, in his "*reasons of decision*," says: "It is true, as Mr. Bain asserts, that no one can monopolize the use of air, fire, or water; but it is equally true that any one can monopolize the use of air, fire, or water, upon certain principles of operation which he may have invented or discovered; and this is precisely what the respective claimants, in this case, demanded as their rights, and gave rise to the interference, viz: each claimed the right to use, and exclude others from using, galvanic power to mark certain signs [which signs have been already patented by said Morse] upon chemically prepared paper through a single circuit of conductors.

"*A single circuit of conductors*, consisting either wholly of wire, or in part of wire and part of earth, for telegraphic purposes, *were not new;* the *signs or signals* to be marked *were not new*, the same having been before patented by said Morse, and *chemically prepared paper*, for receiving telegraphic signs by galvanism, *was not new*, the same having been patented in England in 1838, by Mr. E. Davy. Moreovor, the *use of a single telegraphic circuit*, for marking the aforesaid signs upon paper, *was not new*, the same having been before patented by said Morse.

"Neither party claimed any one or any two of the above elemental features. *The invention of each was made up of the three combined;* and the advantages claimed to have been discovered by each, in these combined operations were identical."

If, then, these matters are not now patentable in themselves, there is nothing patentable in Mr. Morse's claim left to be interferred with, except his claim of a patent for his invention of the machinery described in his specification, or for his combination of machinery and materials, as described therein. The claim of each applicant, therefore, is reduced to the claim *for the cembination of machinery and materials* which he has invented, and does not include any of the matters claimed in his specification which are not now patentable.

These combinations seem to me to be far from identical. Mr. Bain includes in his combination the use of the perforated paper, for *composing* the communication; and of the style which passes the electric current through the perforated paper; and the machinery for transmitting the same communication to several different places at the same time. It is said that the style is not new; but he makes it an ingredient in his combination, and in that respect his combination differs from that of Mr. Morse, and it is a very important item in connexion with the perforated paper. He includes in his combination new patentable matter with old matter, not patentable, and thereby makes a new patentable combination. This new matter, thus introduced into the new combination, is admitted to be patentable in itself without combination with the old unpatentable matter; and, indeed, it seems to be a great improvement in the transmission of telegraphic information.

But it is said that Mr. Bain is only authorized to obtain a separate patent for each of those inventions, and cannot claim a patent for his new combination of the old and new together. If, however, his new combination of old materials be patentable, (which must be admitted, or it would not interfere with Mr. Morse's claim,) it seems to be not the less patentable because it includes the new matter in connexion with the old. The old matter may not, in itself, be patentable, but joined to the new matter, a combination may be formed which may be patented. He is not obliged to take separate patents for each new patentable matter. He does not now ask for them; he may be willing to ask only for a limited use of those new matters—*to wit: in combination;* and not for an exclusive use of them for every purpose to which they may be applicable.

Mr. Godson (in p. 63) says: "A combination or arrangement of old materials, when, in consequence thereof, a new effect is produced, may be the subject of a patent. This effect may consist either in the production of a new article, or in making an old one in a better manner, or at a cheaper rate." "This manufacture may be made of different substances mingled together, or of different machines formed into one, or of the arrangement of many old combinations." "Each distinct part of the manufacture may have been in common use, and every principle upon which it is founded may have been long known, and yet the manufacture may be the proper subject for a patent. It is not for those parts and principles, but for the new and useful compound, or thing thus produced by combination, that the grant is made; it is for combining and using things before known, with something then invented, so as to produce an effect which was never before attained."

The counsel of Mr. Morse, in argument, said:

"It is obvious, and is admitted by our adversaries, that Morse's instrument is a very different thing, in its *form* and *structure*, from Bain's."—But *form* and *structure* are very important matters in machinery; and if they enable the operator to do the work in a better manner, or with more ease, or less expense, or in less time, it is no interferenee; but is an improvement for which the inventor may have a patent.

When the application is for a patent for a combination of machinery and materials, form and structure become *substance;* they are of the essence of the invention; and an admission that Morse's instrument is a very different thing, in its form and structure, from Bain's, is an admission of a fact which is *prima facie* evidence, at least, that there is no interference between the two, and throws the burden of proof on the other side.

There was no evidence laid before the Commissioner of Patents upon the question of interference, so that he must have adjudged the interference upon a comparison of the two specifications; possibly without considering that the only patent which either could obtain would be a patent for his own combination—all the materials of which Mr. Morse's combination consists being old, and not now patentable.

The question is not now whether the claims of Mr. Bain and Mr. Morse interfere as to matters not now patentable, but whether they interfere as to matters *now patentable;* and the only matter now patentable in Mr. Morse's specification is his own combination of machinery and materials. That combination constitutes his machine; and his machine is admitted to be a very different thing, in its form and structure, from Mr. Bain's. Form and structure constitute the identity of machinery. The combination consists in *form* and *structure;* and the patent, if issued, will, I presume, be issued for the *form* and *structure* of the instrument.

It being admitted that the form and structure of Mr. Bain's instrument is very different from Morse's, there can be no interference in that respect, and if form and structure constitute the identity of machinery there is no interference in the two instruments; and if the instruments are the combinations, or the result of the combinations, for which patents are now claimed, there is no interference in the two instruments in regard to any matter now patentable.

But it is not necessary to rely alone upon the admission of Mr. Morse's counsel, to show that there is a great difference between the machinery used by the contending applicants to effect the object: i. e. the rapid transmission of intelligence by the power of the electric current. Any one who will compare the two specifications, and drawings and models, will at once perceive the difference.

A patentable improvement is not an interference.

The Commissioner, in his written decision, says: "It appears from the records of the office, that the application by said Alexander Bain, subject of Great Britain, was made April 18, 1848; and upon examination of his claims, it was found that the before-mentioned claim could be *admitted to patent*, no invention of a like character appearing in the public records of the office, nor in any printed publication. Prior, however, to the final issue of the case, the secret archives were consulted; and it was found that an application, filed by Samuel F. B. Morse, January 20, 1848, had been there deposited, in compliance with provisions of law, which presented claims conflicting with those, before mentioned, set up by said Bain."

This shows that but for the supposed interfering claim of Mr. Morse, Mr. Bain was entitled to his patent; and if there be no interference in respect to patentable matter, he is still entitled to a patent for his own combination.

But the counsel for Mr. Morse say: "There is an interference—that Bain's third claim palpably covers the whole of Morse's first claim; and, if granted, Bain could do all that Morse claims an exclusive right to do; he could write Morse's characters precisely as Morse does; and that herein consists the interference."

But the only matter now patentable, and claimed in Mr. Morse's specification, is *his peculiar combination of material and machinery, as therein described.* All the materials used in that combination are old; and he will not, under this patent, be entitled to the exclusive use of any of them separately, or in any other combination than that which he has described in his specification. There cannot be a patent for a *principle;* nor for the application of a principle; nor for an effect. Two persons may use the same principle and produce the same effect *by different means*, without interference or infringement, and each would be entitled to a patent for his own invention.—*Godson*, 63, 68, 74.

So, in the present case, although the power used by both applicants is the same, and the subject the same, yet, as the effect is produced by means which appear to me so different as to prevent an interference, *the question of priority of invention does not arise.* It is, therefore, not a case under the 8th section of the act of 1836, but under the 7th section of the same act. So that each of the applicants may have a patent for the combination which he has invented, and claimed and described in his specification—provided he shall have complied with all the requisites of the law to entitle him to a patent.

If this were a doubtful question, I should think it my duty to render the same judgment, so as to give Mr. Bain the same right to have the validity of his patent tested by the ordinary tribunals of the country, which Mr. Morse would enjoy as to his patent; and finally, to obtain the judgment of the Supreme Court of the United States upon it. For if the Commissioner and the Judge should reject Mr. Bain's application for a patent, the decision would be final and conclusive against him, unless he could obtain relief by a bill in equity under the 16th section of the act of 1836, and the 10th section of the act of 1839; which, it is said, is doubtful.

I am, therefore, of opinion, and so decide—

That there is no interference in the claims of these applicants, in relation to any matter (contained in their respective specifications) *now patentable;* and therefore that Samuel F. B. Morse is entitled to a patent for the combination which he has invented, claimed, and described in his specification, drawings, and model. And that Alexander Bain is entitled to a patent for the combination which he has invented, claimed, and described in his specification, drawings, and model; provided they shall, respectively, have complied with all the requisites of the law, to entitle them to their respective patents.

I deem it unnecessary, therefore, to decide upon any other points involved by the reasons of appeal.

W. Cranch.

Washington, D. C., March 12, 1849.

FRANKLIN INSTITUTE.

Proceedings of the Stated Monthly Meeting, June 21st, 1849.

Samuel V. Merrick, President, in the chair.

Isaac B. Garrigues, Recording Secretary.

The minutes of the last meeting were read and approved.

Donations to the Library and Cabinet were received from—J. W. P. Lewis, Esq., Philadelphia; William J. McAlpine, Esq., Brooklyn, N. Y.; and Messrs. J. N. Churchill & Co., Hamden, Connecticut.

The Treasurer read his monthly statement of receipts and payments.

The Board of Managers and Standing Committees reported their minutes.

New candidates for membership in the Institute were proposed, and those proposed at the last meeting were elected.

In the absence of the Chairman of the Committee on Meetings, Prof. Frazer exhibited a model of Parker's Water Meter, and explained its construction by means of diagrams.

This instrument is not dissimilar in its construction to the rotating steam engine invented by Bramah & Dickinson, in 1790. (*Galloway & Hebert's History of the Steam Engine, p.* 106.) It consists of a hollow iron drum or cylinder, closed at each end, and firmly attached by its end plates to an axis, which rotates with it. This drum is enclosed in an outer concentric case, through which the axis passes water-tight, leaving sufficient room between them for the passage of the water, which, entering this space, passes around the drum, and escapes by another pipe immediately above its place of entrance. Between the orifices of the two pipes a fixed diaphragm passes across the space between the drum and casing, so as to prevent the water from passing the machine without making its circuit. Through slots in the cylindrical surface of the drum two sliding vanes move freely, of sufficient length and breadth to close the space between the drum and casing. These vanes are at right angles to each other, and are notched, so as to permit them to move freely to a certain extent past each other, in the inner drum. The axis of the drum carries upon it a pinion, by which it is connected with a train of wheels which register its revolutions, as in the ordinary counters. The operation of the machine is as follows: The water entering upon one side of the casing, just below its horizontal diameter, passes along the lower part of the water space, and comes in contact with one of the sliders, which has, by its own gravity, (or by the action of a spring arranged in the upper part of the machine,) fallen across this space; by its pressure it forces this vane around, thus causing the inner drum and its axis to rotate until it reaches the exit pipe, where it escapes. At each fourth of a revolution one of the vanes thus obstructs the passage, and the axis is thus kept, during the passage of the water, in constant rotation, and by its wheels registers the quantity of water passing, when the contents of the water space is once carefully determined. The machine is made to move with a very slight force, and experiments have shewn that the error of its register, varying with the velocity of the machine, (being greatest at low velocities,) does not exceed from 2 to 5 per cent. of the amount of water, and is always in favor of the consumer. A careful set of experiments on each machine, at various velocities, will furnish the means of correcting this error. The machine is made by Messrs. Berkenbine, Martin & Trotter, of this city.

Mr. Whitall exhibited and explained a series of maps of the Heavens, got up by him on a large scale for the purpose of teaching astronomy.

Mr. Root submitted for the inspection of members a number of exceedingly beautiful daguerreotype portraits made by him, and explained the method by which he is enabled to produce a gradual fading away of the drapery from above downwards, by which a much increased effect is given to the head. Pictures of this kind are called by him Crayon Daguerreotypes.

Prof. Frazer exhibited a new and very simple and compact filter, invented by Mr. Latting, of New York. It consists of two concentric tubes, the inner one of which is closed above and is pierced with holes over a portion of its length; around this a piece of flannel or other suitable material is wrapped, and the tube is then placed within the other, in which it fits loosely, and is supported in a concentric position by a collar below. The upper end of the outer tube being screwed on to the hydrant, the water passes through the flannel, and being thus filtered into the inner tube escapes below. When the filtering cloth has become foul, it can easily be withdrawn and another substituted. Prof. F. took occasion to remark that a very similar contrivance had been used and recommended to him several years ago, by Mr. Robert Cornelius, of this city. In that filter the current of water could be passed in either direction, and the filter be thus cleansed.

Prof. Frazer also called the attention of the meeting to a new tilting wagon, invented by Mr. Start, of Dover, Delaware, a model of which had been deposited in the Institute by the inventor. In this contrivance the wagon body was made to slide backwards by friction rollers, over two plates of iron placed on the framing, and of such length as to allow the centre of gravity of the loaded body, when rolled back, to project over the end of the frame. The load would then tilt by its own weight simply. In order to prevent this backward sliding of the wagon body when not desired, two semi-cylindrical cavities, placed at the front end of the rail plates, receive the friction rollers when the body is at rest, and prevent it from moving backwards by every sudden jar, or by the motion of traveling. A series of levers, the outer one of which projects a little beyond the side of the wagon, serve to start the body from this position, and permit it to move backward at the proper time.

Prof. Frazer also laid before the meeting a model of a proposed improvement in rails for railroads, invented by Mr. Elgar, of Baltimore. The object of this improvement is to give uniformity of strength over the whole rail, and to prevent horizontal or vertical displacement. The mode of securing these advantages consists of forming the rail in two similar parts, which are bolted together at distances of two or three feet, and break joints with each other. As the pattern of each part is very simple, the rails can easily be rolled of a length of 20 feet, and a joint will then occur half-way across the rail only, at each 10 feet. To strengthen the rail at each joint, a core of iron is introduced into the hollow of the rail at these points, so as to compensate for the weakness produced by cutting the rail at that point. Mr. E. also presents in the model a new method of fastening the chairs, by means of which the tendency of the shocks to loosen the rail is entirely avoided.

Prof. Frazer then read to the meeting an anecdote of the first trip of Mr. Robert Fulton with his steamboat on the Hudson river, in 1807, submitted to the French Society for the encouragement of National Industry, by M. Michaux, the distinguished botanist, and translated for publication in the Journal of the Institute.

COMMITTEE ON SCIENCE AND THE ARTS.

Report on the Catoptric, Dioptric, and Catadioptric Systems of Lights for Lighthouses.

The Committee on Science and the Arts, constituted by the Franklin Institute of the State of Pennsylvania, for the Promotion of the Mechanic Arts, in compliance with the following resolution, passed by the Franklin Institute at their meeting held April 19th, 1849, viz: "*Resolved,* That the Committee on Science and the Arts be requested to examine and report to the next meeting of the Institute, their opinion of the relative value of the present Catoptric System adopted in the United States, compared with the Fresnel Dioptric and Catadioptric System established in the Lighthouses in Europe and elsewhere, so far as the same can be obtained from documents in the possession of the Institute," REPORT:—

That they have examined the subject intrusted to them with the care and attention which its great importance demands. The immense amount of property, and the many valuable lives dependent on the proper illumination of coasts and harbors, have attracted the attention of men of science, and of nearly all civilized governments. The results have been witnessed in the very great improvements in the structure of lighthouses, and in their reflecting and refracting apparatus, especially of the latter.

The Committee have studied the voluminous documents containing not merely the opinions of a number of the most scientific men in Europe and America, but the actual practical results described in official statements of Lighthouse Boards, in every country where lights of high character have been established. They also have examined much voluminous correspondence, and have endeavored to avail themselves of every attainable source of information relating to the subject. They have also examined the Dioptric and Catadioptric Apparatus of Fresnel, as displayed in the four orders exhibited before the Franklin Institute.

The Catoptric System adopted in the United States is a very imperfect imitation of the European method, which was in use long before its *alleged* invention in this Union. Paraboloidal reflectors, with lamps placed in their foci, were in use nearly seventy years since, in France and Great Britain. The addition of a convex lens in front of the lamp, placed in the focal point of such a reflector, could only have been suggested by a person entirely ignorant of the elementary principles of optics.*

We need not, however, at present enter into the history of the lighthouse system in the United States. We are gratified to learn that a few improvements have been made by the introduction of better forms of reflectors, and in their adjuncts, as well as in their size, finish, and mountings, but these few cases are merely exceptions to the general rule; and it must be acknowledged that the Catoptric System of this country is, in actual practice, far inferior to the Catoptric System of Europe.[1] † We do not deem the former to be of sufficient value to contrast with the Dioptric and Catadioptric Systems of Fresnel, which is rapidly superseding even the latter (the reflecting system) in its best condition. We therefore limit our comparison to the reflecting apparatus of Europe and the apparatus of Fresnel.

A paraboloidal reflector of the best description receives but two-thirds of the light emitted from the lamp; half of this only is reflected, equal to one-third of the whole,[2] and of this third a portion is intercepted by the intervention of a part of the lamp, diminishing the available light to less than one-third—perhaps to one-fourth; and of this one-fourth, a considerable portion is, from the divergence of the penumbral cone, too faint to produce much effect at great distances. In fixed lights many such reflectors are arranged in one or more circles or arcs; but even when very numerous, viz. from twenty to thirty, the light is very unequally distributed, and in some azimuths is invisible; when the reflectors are less numerous, viz. from ten to twenty, this defect is still more manifest.[3]

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* The small spherical reflectors are also defective in principle, but it is not necessary to discuss the defects of this antique apparatus.

† These numbers refer to articles in the Appendix, which will be found in the next number.

With the refracting and Catadioptric apparatus of Fresnel for fixed lights, the whole circle is equally illuminated, (especially when the latest improvements have been introduced,)[4] and nine-tenths nearly of the light emitted from the lamp is rendered available*[5]—glass, as a refracting material in this system, possessing the same advantage over reflectors as the refracting telescope possesses over the reflecting species. The consumption of oil to produce an equal light might readily be inferred to be much less, and practice has proved beyond a doubt that such is the fact.[6]

The superiority of the revolving and of the flashing lights of Fresnel over the revolving reflecting lights must also be conceded.[7] The superior brilliancy of these lights, the intense concentration of their rays, consequently their penetrating power, as well as their *economy in the consumption of oil*, being manifest to the Committee, it remains to inquire whether their first cost or the expense of their management be greater.

In Europe, *for a light of equal intensity*, the first cost is not greater, but as in practice the Fresnel lights are *much more intense* than the reflecting lights, *the first cost* of the apparatus is, in a small ratio, greater than that of the latter, *when of the best description*,[8] (of course we do not allude to the imperfect apparatus in this country,) but their great economy in oil is more than a compensation for the small additional prime cost.[9] They do not require more persons to attend to them, although, in fact, more are required in Europe, for both reflecting and refracting lights, than in the reflecting lights in the United States, but this increase is entirely owing to the importance there justly attached to the maintenance of a steady constant light, which cannot be insured in either system when one keeper only is employed.[10]

The Committee are strongly impressed with the great excellence of the Fresnel system,—a system which has already been established in nearly three hundred places (and everywhere with satisfaction) in Europe, where it is gradually superseding the old and imperfect Catoptric lights, whilst in no instance has it been abandoned after it has been established.

The opinion of scientific men throughout the world is believed to be decidedly in favor of the Fresnel system of lights, where a large arc of a circle requires illumination. In the United States, this invention has been introduced only at one station. The Committee earnestly hope that our whole coast, wherever it may be adapted to them, on both oceans, and on the lakes, may speedily be provided with this brilliant, economical, and admirably devised gift of the science and art of the nineteenth century

By order of the Committee, William Hamilton, *Actuary.*
Philadelphia, May 10th, 1849.

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* Subject, of course, to a *small* deduction in the passage through the glass.

Mechanics' Institutes and Exhibitions of American Manufactures.

The rapid increase throughout the Union of Mechanics' Institutions, and the establishment of regular periodical exhibitions of American Manufactures in our principal cities, furnish to the lover of his country a very gratifying evidence of the healthy condition of public sentiment on these important subjects among our citizens. Especially cheering is the extension of these institution in the Western and Southern portions of our country. The experience of our own Institute proves the vast advantages which accrue from them to the mechanic, both in furnishing him with facilities of improvement in his branch of industry, and in elevating his character as a thinking and independent member of the community. And nothing can more tend to promote the feeling of mutual attachment among the citizens of our widely spread republic, which is so essential to the preservation of our Union, and we believe so much desired by the mass of the community in all sections of the country, than the healthy rivalry and friendly communion which such institutions excite and promote.

We have received the circulars announcing exhibitions during the ensuing autumn in the cities of Cincinnati and Baltimore. Our own annual will also be held as usual, as well as that of the New York American Institute. There will probably be others of which we have not yet heard. The order of the above is as follows:—The Tenth Annual Exhibition of American Manufactures will be held under the direction of the Mechanics' Institute, in the city of Cincinnati, commencing on the 5th of September, 1849; the rooms will be opened for the reception of goods on the 1st of August. The Second Exhibition of the Maryland Institute for the Promotion of the Mechanic Arts will be opened at the Washington Hall, in the city of Baltimore, on Thursday, the 27th of September, 1849, and will close on Saturday, the 13th October; goods will be received from the 20th September. The Exhibition of the New York American Institute will be opened at Castle Garden, on Tuesday, 2d of October; goods will be received on the 28th and 29th of September. The Franklin Institute will open its Exhibition in the halls of the Museum Building, in the city of Philadelphia, on Tuesday, October 16th, and it will be closed on Saturday, 27th of the same month. The rooms will be ready for the reception of goods on Friday the 12th of October.

Our opening remarks were elicited by the perusal of a pamphlet which has been sent to us, (and for which we return our thanks,) containing the "*Constitution of the South Carolina Institute for the Promotion of Art, Mechanical Ingenuity, and Industry; adopted January*, 1849; together with an Address to Mechanics, Manufacturers, and others interested in its objects. It was gratifying to see this additional evidence of what the recent establishment of manufacturing establishments in the South had taught us, that our Southern brethren were awaking to their true interests and duties, and it was doubly pleasing to find, upon perusing this address, that while they appreciate and frankly acknowledge their present position, they are now disposed to exercise their well known energy to recover the importance and influence which will be justly their due. The address is very ably conceived, and we are sure must produce the effect for which it was intended. It is plain and statistical in its statements, frank in its declarations, and moderate in its tone, and the only error that we can point out in it, is the use of the word "*foreigners*," as applied to citizens of other States. We have no doubt that this is an inadvertence, but one of which mischief makers (who are truly foreigners in such institutions) will gladly take hold, and we can assure our Southern friends that we neither are, nor intend to be, foreign to them in any respect.

If our limits would permit, we would gladly reproduce the whole of this able address; as it is, we present some extracts from it as a specimen of its tone.

The following statement is an interesting addition to our statistics:—

"In South Carolina, where coarse goods are only made, its value is increased three times. The quantity of cotton cloth, of every kind, used in South Carolina the last year, was not far from thirteen million yards, worth about one million dollars. The cost of the raw material used was about $300,000—the remaining $700,000 was paid by the people of this State to those who spun and wove the cloth, transported the cotton and goods, and furnished the capital for manufacturing. A small portion of these goods have been made by our own factories, and so far the money has been circulated among our own people, but the greater part has passed to foreign hands."

"We ought to be prepared here, in Charleston, to furnish the machinery wanted to manufacture this cloth for South Carolina, and there never was a more inviting prospect opened for enterprise and capital, nor a more favorable location presented than is now offered in our city for the establishment of a machine shop for constructing cotton and woollen machinery."

"It has been objected by some, that cotton factories would become so numerous, the business would be overdone, and ruin would follow. It certainly need not be *our* fear just yet, that *we* shall glut the market with goods, when all the spindles in the whole south are outnumbered three times over by *Lowell alone.* When we have superseded northern fabrics in the various markets of our country,—when the product of our factories shall reach one hundred and fifty million of dollars per annum, as do the northern looms,—then we may begin to look abroad for relief from the burthen of over production; but even then we may *hope* that, as we have so much advantage, we may successfully compete with old or New England, in China, South America, and other foreign markets. In the mean time, let us quietly supersede northern goods in *our own.*"

The following anticipations we will gladly see realized:—

"Those who are familiar with the characteristics of the people of the Southern States, can say whether she will be likely to slumber again over her destiny, or whether she will not go forth with that vehemence of energy which has been more than once exhibited under other circumstances. It may be hard to change old habits and fixed policies among us,—it has been hard and laborious work,—but be assured the course of public opinion is beginning to carry us *onward*, and soon it will rush with overwhelming power through every section of the South, bearing nobly on those who yield to its influence, but overwhelming those who would check its career."

On page 19 we have an interesting anecdote, important in its bearing, which we do not remember to have before seen.

"The history of the Hon. Samuel Williston, is a singular evidence of the great results obtained by industry in a mechanic pursuit. He commenced the making of the same little article, "buttons," in 1826, in his father's kitchen. Within ten years afterwards, he had regenerated his native place; had given an impulse to business; had built academies and churches; had created a flourishing town upon the ruins of a thriftless village, and had in his employment, at one time, two thousand persons; he has now amassed a fortune, besides giving, during the last ten years, more than $100,000 to colleges and schools!"

The following will interest some of our readers who are looking for an opening to establish themselves as machinists:—

"South of the Potomac, you can find no machine shop where cotton and woollen machinery is made, and yet the South is calling, in loudest tones, for the establishment of cotton and woollen factories over her whole extent. In Georgia, there are now forty-two cotton factories, and in South Carolina, thirteen. These have cost, for machinery, not less than two million of dollars; while the freight alone, from northern workshops to southern seaports, has been not less than $100,000, and the demand for this kind of work is constantly increasing.

"We would invite earnest consideration on the part of capitalists and practical machinists to this point. Charleston is peculiarly located to favor the establishment of a machine shop on a large scale. Experienced workmen can be obtained, and work can be done here as cheaply as in Paterson, Providence, or Taunton, *after patterns* have once been procured.—Look at the machinery which passed into and through Charleston and Savannah the last year:—

Augusta Manufacturing Company	$100,000
Graniteville " "	120,000
Charleston " "	50,000
One or two small factories in Georgia	30,000
And orders yet unfilled, to an equal amount,	$300,000

"This machinery is burdened with charges for freight, transportation, &c., equal to 10 per cent., $30,000. This is a subject of deep interest to those in Charleston, who are engaged in manufactures, or intend to be. Machines made here would save both freight and boxing! and these two items would be a splendid *bonus* for a new establishment. Be assured *northern enterprise* and *capital* will not long overlook the opening for business here presented."

The conclusion of the address expresses the intentions and aim of the Association in strong and eloquent language, and contains statements which cannot too often be brought before, or too strongly pressed upon, our communities in all sections of the Union.

"Why further allude to facts which apply to almost every kind of mechanical pursuit with overwhelming force? Why allude to them at all? Only that, if possible, we may press upon you motive for exertion, and awake a laudable ambition to elevate from its low position southern mechanic art. Can this be done by this association? Doubtless to some extent. The very object in view in our organization is to invite you all,—every one who possesses the spirit of a native or adopted son of the South, to do something to elevate his profession. We wish to bring you before your fellow citizens by an exhibition of your skill—we wish to encourage each and all of you to feel that you can excel in your own particular branch of work. and we desire to show to the world that our southern artizans can compete with others if placed in as favorable circumstances. We organize, too, for the purpose of inviting you to prepare articles of your own work for public exhibition at some future period, under the auspices of the Society, and to this exhibition we earnestly invite manufacturers of every kind in wool and cotton, and artizans in every department, to send such specimens of their skill as may be suited for such a display. We extend our invitation, too, to those among us who are engaged in the more delicate labor of forming articles of ornament and decoration, and whose quiet and beautiful industry is scarcely known even by those with whom they daily associate.

"But we have higher aims in our Association than that of exhibiting specimens of skill in mechanics or manufactures. We desire to cultivate the mental faculties—we wish to open facilities, by which every one so disposed may be made more acquainted with the great secret of "*power*" and "*wealth*"—KNOWLEDGE; and we do most devoutly believe and maintain that every advance in mechanics and manufactures, in this country, is a direct aid in advancing education and refinement. In general, it will be seen that a high grade of common school education among the masses of our people, can only be found where population is somewhat condensed. The population in this State being agricultural, is very sparse, scattered over a large tract of country, and deprived of those advantages which are accessible to those who live in towns and villages. It is not surprising that a vast number of our industrious and worthy people are excessively ignorant; but facts speak louder than words, and to these we again resort. There has lately been established, near our city, a factory which employs one hundred operatives, gathered from the city and surrounding country. Of this number, it has been found that more than one-half are unable to write their names upon the treasurer's pay roll. To this it may be said, that of this number there are many foreigners and their children, and that this is scarcely a fair exhibit. Well, admit the objection, and we will refer you to another factory where this objection can have no force. There are now gathered in Graniteville six hundred people from the neighboring districts, of which one hundred and fifty are employed in the mill; of this one hundred and fifty, there are not over sixty that can write their names, and not one-half of the six hundred can read or write; and yet these people have in them the elements of a valuable population. They are healthy, industrious, and well disposed—perfectly willing to work, and many of them painfully sensible of the low position they hold in the scale of social life. To such a people as these, the general introduction of manufactures into the State would be a blessing of no ordinary magnitude; they would then collect together from the miserable cabins in which they have vegetated, they would be brought into contact with their fellows, and would soon, by example and advice, become willing to place themselves under proper moral and mental culture, and so be converted from miserable, ignorant, poverty-striken beings, into intelligent, comfortable, and happy members of society. With many, it is true, all this comes *too late—they* have passed the age when much improvement is possible, but it comes in time for the youthful, and for children, and the singular spectacle will be presented in our factory villages, of a generation of parents unable to read or write, while their children will be comparatively well educated; and by this means,—by education, by knowledge, by mental and moral culture, our citizens will become more capable of enlarging their dominion over the universe of matter. We desire, in our Association, to combine influence, intellect, and capital, so as to produce the most positive good. Here we may hope to gather some who have power to instruct in those branches of science which are requisite in a high state of mechanic art; and those also who, by their own skill may carry into practice the principles so taught. Here we hope to gather such works of general usefulness as may now be without the reach of most of us, and by these means the library, lectures, and public exhibitions, with occasional discussion, we may hope to carry forward the great work we are now commencing, with triumphant success."

Right gladly will the Franklin Institute hail the appearance of this new and manly fellow laborer in the field of mechanical industry, and hopefully do we look forward to the vast results which energy, such as is here indicated, will produce upon the condition of a portion of our Republic, which needs only to have its powers rightly directed to be a mighty aid in the improvement of civilization. F.

BIBLIOGRAPHICAL NOTICES.

Messrs. D. Appleton & Co., of No. 200 Broadway, New York, have issued a circular announcing the speedy publication of a Dictionary of Machines, Mechanics, and Engineering, "which they design shall present Working Drawings and Descriptions of every important Machine in practical use in the United States." "The work will comprise at least 1500 plates, sufficiently large to be of practical value to the Mechanic, Engineer, and Machinist. The volume will be of royal 8vo. size, a page somewhat larger than Ure's Dictionary of Arts, &c., containing nearly 2000 pages," and will be edited by Mr. Oliver Byrne. The work is especially designed to make public the results of American skill and ingenuity, the greater part of which now scarcely meet the public eye, until they are appropriated upon the other side of the Atlantic, and make their appearance among us in a foreign dress. The publishers therefore particularly desire information as to all American tools and inventions, even although they may have been before published in other ways.

A work of this kind is very much wanted among us, and if well edited, as it doubtless will be, will be an acquisition of very great value to our mechanics and manufacturers. It will contain a vast mass of information on mechanics and machinery in general, and will doubtless save inventors much useless trouble and expense, from the so often recurring re-invention of old machines. The publication is in able hands, and we hope will meet with the encouragement which it so fully deserves. F.

JOURNAL
OF
THE FRANKLIN INSTITUTE
OF THE STATE OF PENNSYLVANIA
FOR THE
PROMOTION OF THE MECHANIC ARTS.

AUGUST, 1849.

CIVIL ENGINEERING.

Contributions to Railway Statistics, in 1846, 1847, *and* 1848. *By* HYDE CLARKE, ESQ.

(Continued from page 5.)

No. 3.—*Coal Traffic.* Coal traffic is one of the largest and most important items of railway transit; but here, as elsewhere, the returns published by the Railway Department are insufficient to show the whole amount.—This is the more to be regretted, as the great reduction in the price of coal by railways has largely increased the demand for household use, as well as for manufacturing purposes. The monopolies of the canal proprietors, and of the wharfingers connected with them, have been broken up, and each year some new operation throws open a fresh district.

Coal traffic is of three kinds: from the colliery inland; from the colliery to the sea; and from the sea-shore inland.

The quantity enumerated amounts to about 8,900,000, or nearly 9,000,000; the number enumerated in 1845 being 7,000,000 tons.

The amounts received for the carriage of coals in the years ending June 30, 1846 and 1847, constitute a total of nearly £550,000, so that the gross total is most probably nearly £700,000, being the sum received by railways on account of the conveyance of coal. Among the lines omitted are the following:—Great Western, Edinburgh and Glasgow, Glasgow and Ayr, London and South Western, Eastern Counties—Colchester, Monkland and Kirkintilloch.

The rates of charge vary much on the several lines, depending on many circumstances, so that it is impossible to institute an accurate comparison. In some cases, the coal owners supply their own locomotives and wagons, and are charged with toll only. In others, they supply wagons only. In others, they are charged with an additional rent for wagons. In many cases the company hauls and supplies wagons.

Rate per ton per mile for toll only, and for total charges—

	Toll. *d.*	Total charges. *d.*
West Cornwall	—	5·82
Dunfermline and Charlestown	—	4·29
Bodmin and Wadebridge	—	4·00
Newcastle and Berwick, (North Shields)	—	3·50
Arbroath and Forfair	2·00	3·30
Cockermouth	—	3·11
Scotch Midland	—	3·07
Kendal and Windermere	—	3·00
Ballochney	—	3·00
Preston and Longridge	—	2·66
Furness	—	2·50
Maryport and Carlisle	1·30	2·47
Londonderry and Enniskillen	—	2·10
Wishaw and Coltness	1·60	2·03
Brighton	0·25	2·00
Slamannan	—	1·88
East Lancashire	—	1·85
London and South Western	—	1·77
Lancaster and Carlisle	—	1·75
Whitehaven	—	1·60
Edinburgh and Glasgow	—	1·50
Caledonian	—	1·43
St. Helen's	0·70	1·40
Llanelly	—	1·35
Ipswich and Bury	—	1·34
Shrewsbury and Chester	—	1·33
Bristol and Birmingham	—	1·32
Eastern Union	—	1·26
York and Newcastle	—	1·25
Newcastle and Carlisle	—	1·25
Glasgow and Greenock	0·81	1·25
Hartlepool	0·75	1·25
Taff Vale	0·66	1·16
Stockton and Hartlepool	—	1·06
Lancashire and Yorkshire	—	1·01
North British	—	1·00
Preston and Wyre	—	1·00
Eastern Counties (Cambridge)	—	1·00
Clarence	—	0·89
York and North Midland	—	0·75

On the whole, the rates for the carriage of coal are lower than they were in 1845; only a small quantity of coal is carried on the higher priced lines.

The following shows the quantity of coal carried in the year ending June 30, 1847, at each rate of charge:—

3*d.* and upwards	302,126 tons.
2*d.* and upwards	198,252 "
1*d.* and upwards	3,930,795 "
Under 1*d.*	629,416 "

Of the 3,930,795 tons carried at prices between 1*d.* and 2*d.*, 3,812,725 tons were carried at rates less than 1½*d.* per ton per mile. It will be seen that nearly all the coal carried by railway is carried for less than 1½*d.* per ton per mile.

The maximum charge for carrying coal is now 5·82*d.* per ton per mile, being on the West Cornwall or Hayle Railway. In 1845, the maximum charge was 6*d.* per ton per mile, being on the Canterbury and Whitstable railway.

Many of the Companies make no return of their charges for carrying coal, which is the more to be regretted, as the amalgamations have caused great alterations in the carrying rates.

The chief coal lines are the following:—

	1844–5. Tons.	1845–6. Tons.	1846–7. Tons.
York and Newcastle,	1,616,555	1,962,334	1,654,029
Stockton and Darlington,	900,000	904,358	911,645
Hartlepool,	796,486	893,701	789,673
Stockton and Hartlepool,	300,000	521,508	544,498
Midland,	492,420	395,325	481,344
London and North Western,	——	481,568	440,000
Caledonian,	——	227,183	335,319
Taff Vale,	125,066	284,066	314,621
St. Helens,	229,775	245,573	247,734
Glasgow and Ayr,	120,000	180,130	242,443
Newcastle and Carlisle,	205,500	190,068	236,649
North Union,	321,923	395,021	233,137

The Ballochney, Monkland, and other railways in the neighborhood, have a vast coal traffic; but, from the state of the returns, no calculations can be made as to its extent.

It cannot be said that the coal traffic greatly advanced in the year ending June 30, 1847. Though a great advance was made in the previous year, there seem to be in 1847 symptoms of the effects of the commercial crisis. A decline took place in the receipts of the York and Newcastle, and Midland, though an increase took place on the Stockton and Darlington, and Newcastle and Carlisle.

The coals conveyed by railway from the several fields are as follows:—

	1845. Tons.	1846. Tons.	1847. Tons.
Northumberland and Durham,	3,850,000	4,500,000	4,250,000
Cumberland,	200,000	135,000	190,000
Leicester, Nottingham & Derby,	300,000	300,000	370,000
Lancashire,	900,000	1,270,000	1,000,000
Yorkshire,	——	240,000	190,000
Briston,	50,000	90,000	100,000
South Wales,	220,000	380,000	400,000
Scotland,	760,000	1,650,000	2,100,000

It is impossible to separate the returns accurately, but it may be assumed that the quantity of coal carried by railway has increased in the Scotch and Cumberland fields. The produce of the Staffordshire fields cannot be separated.

The following shows the quantity of coals carried inland from the sea in each year:—

		1845. Tons.	1846. Tons.	1847. Tons.
Eastern Counties:	Cambridge,	——	15,000	15,000
"	Colchester,	20,000	26,976	20,000
"	Eastern Union,	——	——	16,000
"	Ipswich and Bury,	——	——	19,000
"	Norfolk,	——	6,000	15,000
South Eastern,		35,519	45,350	71,723
Brighton,		36,000	40,000	40,000
South Western,		4,000	18,830	31,659
London and North Western,		10,000	10,000	10,000
Cornwall,		28,000	30,065	33,545

The quantity of coal carried inland by means of railways has increased.

The saving in coal supplied to the city of York, in consequence of Mr. Hudson's railway measures, is not less than £30,000 yearly.

In the south-east of England, which is supplied mostly from the Northumberland and Durham coal field, the quantity carried upland by railway may be reckoned as follows:—

1845 - - - -	120,000 tons.
1846 - - - - -	162,000 "
1847 - - - -	240,000 "

How trivial this is, may be seen from the quantity of coals imported into London, which is thus shown:—

1825 - - - -	1,921,091 tons.
1835 - - - - -	2,299,816 "
1845 - - - -	3,461,199 "

It will be seen that in the supply of the inland districts the railways have proved very effective; but they have as yet done very little for those districts which are supplied from the sea. This must be attributed to the inability of the railway companies to give their attention at present to this branch of traffic; but when they do, a complete revolution must be effected in the supply of coals. The only lines from which we have detailed returns are the South Eastern and South Western, which show a great increase in the quantity of coal carried. There is every reason to believe that a great traffic is growing up in the Eastern Counties district—not less than 85,000 tons: but the returns do not show this fully.

No. 4.—*Coke Traffic.* The traffic in coke must be considerable in some districts, but there is a want of detailed returns. It is a lucrative branch of revenue to the Midland Railway Company.

The following shows the receipts for coke:—

	1846.	1847.
Midland - - - -	£20,210	£24,198
Manchester and Bolton - -	16	——
Newcastle and Carlisle -	391	457
York and North Midland -	4,772	7,792

No. 5.—Ironstone and Iron Traffic. The rates charged for the conveyance of ironstone and iron ore are as follows:—

	Per ton per mile.
Ballochney	2·25*d.*
Newcastle and Carlisle	1·37
Taff Vale	1·16
Whitehaven	1·25
Wishaw and Coltness	2·23

The iron carried is mostly pig iron.

The rates for the carriage of iron are as follows:—

	Bar Iron. Per mile per ton.	Pig Iron. Per mile per ton.
Ballochney	3·00*d.*	1·66*d.*
Lancashire and Yorkshire	2·25	——
Maryport and Carlisle	——	1·80
Taff Vale	——	1·00
Wishaw and Coltness	——	1·84
Whitehaven	——	1·88

The traffic of the Glasgow iron district in coals, limestone, ironstone, iron dross, and slag, carried by railway was, in 1846 and 1847, as follows:

	1846.	1847.
Tons	2,500,000	2,900,000

The traffic of the Welsh iron district in coals, limestone, ironstone, and iron, stands as follows:—

	1844.	1845.	1846.	1847.
Tons,	242,000	323,000	396,000	441,000

The traffic of the Furness iron district consists solely in the shipment of ironstone to South Wales, to the extent of 106,301 tons in 1847.

No. 7.—Limestone and Lime. The quantity of limestone carried for agricultural purposes may be reckoned thus:—

District.	Tons.
Scotland	40,000
Northern	50,000
Yorkshire	25,000
Lancashire	25,000
Midland	50,000
Southern	20,000
Total	210,000

The rates for the carriage of a ton of limestone and lime per mile is as follows:—

	Lime.	Limestone.
Arbroath and Forfair	2·05*d.*	——
Llanelly and Llandilo	——	1·00*d.*
Maryport and Carlisle	1·50	1·30
Lancashire and Yorkshire	1·33	——
Newcastle and Carlisle	1·25	1·25
Slamannan	1·90	——
Wishaw and Coltness	——	1·35
York and North Midland	1·50	1·50

No. 8.—*Stone Traffic.* The total quantity of building and paving stones, limestones, and lime, carried on railways in 1847 was as follows, according to the enumerated returns:—

Building stones - - -	404,000 tons.
Limestones and lime - -	146,000 "
Total - -	550,000 tons.

The enumerated traffic gives the enormous amount of 550,000 tons of stones carried, but the whole quantity carried must be nearer 1,000,000 tons. Civ. Eng. & Arch. Jour., Sept. 1848.

(To be Continued.)

Railways through Europe.

The communication by rail is now either complete, or will soon be, *viâ* Calais, right through the heart of Europe, including Paris, Brussels, Cologne, Antwerp, the Rhine, Berlin, Warsaw, Leipsic, Vienna, Switzerland, and Venice. Arrangements are already in progress for a grand continuous tour, or route, through most of the places here named. Paris itself will thus be approximated to London by a time distance of only eleven hours, or a run actually shorter than that to either of its own provincial capitals, Edinburgh or Dublin. Lond. Build. Feb. 17.

Report upon the Use of Anthracite Coal in Locomotive Engines on the Reading Railroad, made to the President of the Reading Railroad Company, by George W. Whistler, Jr., *April* 20, 1849.

(Continued from page 12.)

The Comparison of Engines in their Cost for Repairs.

The most satisfactory comparison of the cost of maintaining Locomotive Engines, is that shown by a statement of the miles run during a certain period of time; but when Engines under comparison differ in their construction, for the purpose of developing some new mode of action, or, as in the case on the Reading Railroad, for the use of a new fuel, then a fair difference in their cost for repairs would be that excess caused by the use of one fuel as compared with the other, and also any excess in repairs caused by a mode of construction differing from that which is common, but necessary to the use of the new fuel.

The Reading Railroad has two distinct classes of Engines in the coal trade; the first and most numerous are the Engines burning wood, and of these there are several varieties, some on eight and others on six wheels, but all essentially alike, and the principal part of them were built at Philadelphia by Mr. M. W. Baldwin. The second class, burning anthracite coal, are few in number, and, with the exception of the Engine *Novelty*, were built at Baltimore by Mr. Ross Winans.

A description of these two classes of Engines has been given in the first part of this report, and it is only necessary to explain in what manner the

Baltimore Coal Engines differ from the eight wheeled wood Engines built at the same time and under the same specification, with a clause in the contract for the former, having reference to the burning of coal.

The essential point in which the Baltimore Engines differ from the wood Engines, is their having a much larger fire-place and area of grate for the combustion of coal; this increase of fire-grate was gotten by an addition made to the ordinary fire-box, and projecting back from that part of the fire-box immediately under the foot-board; this mode of construction threw the engine out of balance, for it was found that, of the twenty-seven tons weight (with coal and water) on eight driving wheels, 16·5 tons were on the four back drivers, and 10·5 tons on the four front drivers; to correct this disproportion of weight on the driving wheels, as well as to relieve the Engine of a portion of its adhesion, a small pair of trailing wheels were placed behind the fire-box, which bore two tons weight of the Engine, and also transferred two tons to the four forward drivers, thus balancing the Engine on its eight driving wheels, with twenty-five tons of adhesion. Of the Engines proper, cylinders, pistons, cross-heads, connecting rods, crankpins, frame, boxes, springs, wheels, valves, &c., there is no part of their construction which has any connexion with the burning of coal, and these parts differ from similar parts of wood Engines, as one builder differs from another, for reasons wholly independent of the boiler and its purposes; therefore the increased expenditure for repairs on account of the peculiar construction which is necessary to the use of coal, is confined in these Engines to the increased size of the fire place, and the small pair of trailing wheels for the support of its overhanging weight.

The principal item of excess in the cost for repairs of Engines burning coal over those burning wood, is caused by the destructive effects of a coal fire upon the inside sheets of the fire box; and when iron (the soundness of which is always uncertain from the manner in which it is at present made) has been used entirely for fire-boxes, this intense local heat has very soon blistered and burned away the sheets in the immediate vicinity of the coal fire. Another destructive effect from the use of coal is its severity on the laps or joinings of sheets in the fire place. To obviate this difficulty much larger sheets were used, but this again was found to increase the first evil, and finally, the uncertainty of procuring perfectly sound sheets of boiler iron of large size, (the difficulty of making them sound increasing with their size,) led to the abandonment of iron fire sheets for a distance of two feet above the grate, and the substitution of copper as a more certainly sound material.

The experience on the Reading Railroad with anthracite coal has developed a rapid and unexpected destruction to the copper fire sheets, from the mechanical action of the sharp particles of coal which flake off from the fresh coal when suddenly heated, and impinge upon and cut away the copper sheets forming the sides to the fire place. The occasional melting of grate bars, the increased liability to leakage, the wear and destruction to the ends of tubes by caulking, &c., and the accumulation and igniting of fine coal in the smoke box, all produce their share of extra expense for repairs, over wood-burning Engines.

In order to judge with some degree of accuracy of the use of anthracite coal in Locomotive Engines, when compared with the use of wood, as well as in its effects upon the Engines, as the business of the road, I have given the date at which each coal Engine made its first trip upon the Reading Road, the number of trips made to the first of October last, and the miles run by each Engine during one year, estimated from the recorded trips; also the average number of miles run by the eight and six-wheeled wood Engines as shown by the report for 1847. Of the Baltimore Engines, the *Delaware* and *Maryland* had iron fire-boxes throughout, while the *Baltimore* and *Ohio* had copper sheets in their fire places, extending two feet above and one below the surface of the grate. The *Novelty*, during the time she has been upon the road, has had two boilers; the first boiler had an iron fire-box of very large dimensions, the second, made in the spring of 1848, also has an iron fire-box, but of smaller dimensions.

Tabulated Comparison of Engines on the Reading Railroad—Miles Run.

Name or Class of Engines.	First trip made over the road.	Trips made to September, 30th, 1848.	Miles run to September 30th, 1848.	Trips made from October, 1847, to October, 1848.	Average number of miles run in one year.	Coal hauled in one year—Tons.	Gross Load hauled in one year—Tons.
Baltimore . . .	June 18th, 1847.	251·0	23,845	194	18,430*		
Maryland . . .	Sept. 4th, "	172·5	16,388	162	15,390*		
Delaware . . .	" 12th, "	185·5	17,622	175	16,625*		
Ohio	" 22d, "	194·5	18,477	190	18,050		
Totals and Averages of the Baltimore Engines .	" 1st, "	803·5	76,332	180	17,124	40,500	81,000
Novelty . . .	June 17th, "	152·0	—	118	11,210	21,925	43,850
15 Eight-wheeled Engines,	—	—	—	—	21,129	46,700	93,400
19 Six-wheeled Engines,	—	—	—	—	17,517	34,575	69,151

* Time lost by renewing fire-sheets, included in the year.

The *Baltimore*, which came upon the road June 18th, 1847, completed her 251 trips in August, 1848, at which time she was brought into the shop to have the copper sheets in the fire place renewed, and did not commence her trips again upon the road till October 23d. The *Maryland* and *Delaware* each had their iron fire sheets renewed with copper, after seven months use. The *Ohio* has still, April, 1849, the original copper sheets in her fire-box.

By the foregoing statement, it will be seen that the *Baltimore's* copper fire place has lasted fourteen months; this is about one-third of the time experience had proved similar fire places to last in Engines burning bituminous coal upon the Baltimore and Ohio Railroad, and from which experience it was confidently expected that the copper fire places in Engines burning anthracite coal would last two years. The immediate cause of this speedy destruction on the Reading Railroad is the large quantity of fuel which is required to be burned in a given time, thus hastening the destructive effects of coal, as already explained, in proportion to the quantity consumed.

The extent of the destruction to fire sheets caused by the mechanical action of the particles of coal is very limited, about fourteen inches in width through the entire length of the fire place, seven inches above and the same below the surface of the coal fire. In the line of the staybolts, both vertically and horizontally, the copper retains its original thickness, and upon the copper sheet immediately below the tube or flue sheet, there is no indication of wear, and none could take place from the causes just mentioned; for the particles of coal which are carried towards the tubes, bank against and protect this sheet. The melting of grate bars consequent upon the use of coal is quite uncertain, I have known whole sets to be destroyed as often as once a month, and again, with care, a single set to last several months. The principal causes which govern this waste are, the care bestowed by the firemen in keeping clear the fire-grate and ash-pan, and the nature of the coal used. If cinder is allowed to adhere and accumulate upon the grate, it will soon be destroyed; for the current of air is prevented that free access through all parts of the grate so necessary to its preservation. The neglect, however, to keep the ash-pan free from cinder and ashes, and when free, flooded with water to the depth of several inches, is the great cause of destruction to the grate bars. With bad coal, grate bars have melted by the accumulation of cinder which has taken place in a single trip; this, however, rarely occurs. The extra caulking of tubes, which is required by the use of coal, makes it necessary in time to remove the tubes, and to weld on new ends; some slight wear is also caused within a few inches of their ends by the mechanical action of the particles of coal, but producing no material injury.

I have thus stated the causes which produce the principal excess of repairs in Engines burning coal, over wood-burning Engines, and submit below an estimate of the entire extra cost of the *Baltimore coal Engines*, (so far as this cost for repairs relates to the burning of coal,) over the Engines burning wood upon the Reading Railroad of like power.

Cost per Engine for Renewing Fire Box.

800 lbs. Copper Fire-sheets, at 26 cents,	$208·00
110 “ “ Stay-bolts, “	28·60
65 “ Iron “ at 6 cents,	3·90
2½ days' work cutting stay-bolts, at $3,	7·50
7 weeks' work of two men removing old and renewing fire-sheets, at $10 per week,	140·00
7 weeks' work of two men, at $7 per week, at ditto,	98·00
	486·00
Deduct for 600 lbs. old copper, at 18 cents,	108·00
Cost for renewing fire-place,	$378·00

The *Baltimore's* copper fire-place was renewed after fourteen months' service, and if this be supposed the limit of durability on the Reading Road, it will involve an annual expense of	$324·00
Deduct for depreciation of fire-box of wood-burning Engines in this time,	75·00
Remaining,	$249·00

Extra Cost per year over Wood Engines, for each Baltimore Coal Engine on the Reading Railroad, from the use of Anthracite Coal.

Cost for renewing fire place,	$249·00
3 sets of grate bars,—3225 lbs. cast iron, at 2½ cents,	80·64
Door plates, 500 lbs. cast iron, at 2½ cents,	12·50
Carried over,	$342·14

Amount brought forward,	$342·14
4 days' work of two men removing 50 tubes, at $1·75 and $1,	11·00
7½ days' work of two men welding new ends to tubes, at $1·75 and $1,	20·63
83 lbs. wrought iron for repairing tubes, at 6 cents,	4·98
3 days' work of three men caulking tubes, one man at $1·75, and two at $1 per day,	11·25
Extra work, caulking, &c.,	20·00
Work in smoke box,	35·00
1 set of trailing wheels, 300 lbs. cast iron, at 2½ cents,	7·50
1 day's work of two men fitting up ditto, at $2 and $1·50,	3·50
	$456·00

Experience proves that much unnecessary expense may be avoided in renewing the copper fire sheets of these Engines; for all that part of the copper which extends below the surface of the grate (thirteen inches) is entirely uninjured, and therefore does not require to be removed, and in estimating the necessary cost for repairs of these Engines, the item of copper may be reduced one-third, and in constructing Engines of equal power, a saving may be made in the original outlay, as sheets of copper twenty-five inches wide will be found quite sufficient for all purposes of protection from intense heat, for the water way in the fire-place need not extend below the grate further than is common, say one or two inches.

I have made no comparative estimate of the cost for repairs for the *Baltimore Coal Engines* and the coal Engine *Novelty;* the miles run during one year by these Engines is the most satisfactory that could be made.—The fire-place of the *Novelty's* boiler has proved quite as destructible as the fire-place of the *Baltimore Engines;* already several sheets have been renewed in the new boiler, after a few months' work; and I think it will be found, that although made uncommonly large, for the purpose of diffusing the local heat, its cost to keep in repair (when compared with the fire-place of the *Baltimore Engines*) will be found to increase in proportion to its size. In the destruction of grate bars, wear and tear of extra parts and machinery necessary to her coal-burning peculiarities, there can be no doubt of greatly increased costs over the *Baltimore Engines.*

Experience of the Baltimore and Ohio and other Railroads, in the use of Coal in Locomotive Engines.

It will be difficult to form any correct estimate of the value of anthracite coal as a fuel in comparison with wood, from any direct experiments that were made on the Baltimore and Ohio Railroad, from its earliest introduction in 1831, to its final abandonment for bituminous coal in 1840. The early reports of this company give a great many facts, and show most conclusively that this coal was used with entire success in all the Engines on the road, which, in 1840, numbered fifteen on the "Main Stem." The Engines were built with upright boilers expressly for the use of anthracite coal, and no experiments were made to test its relative value with wood. The company did not determine to use coal on the score of economy, for at the opening of the road, and for some time after, coal was $8 per ton, while wood did not exceed $2·50 per cord, the danger from fire, however, by the use of wood, but, more than all, the precedent of the English Railways then just coming into successful operation, which pointed to a mineral fuel as seemingly the only fuel fit for Locomotive Engines, were the considerations which induced its use. In the spring and summer of 1840, however, an investigation was made of the relative values of anthracite and bituminous coal, by Mr. James Murray, then Engineer of Machinery on the Baltimore and Ohio Railroad; these experiment will enable a fair comparison to be instituted between anthracite coal and wood; for the oft repeated trials of bituminous coal with wood have established their equivalent quantities beyond a doubt.

To a more ready understanding of the facts which I shall present of the experience with fuel on the Baltimore and Ohio Railroad, and the application of these facts to the Reading Road, a short description of this road to its present terminus is given. The road is 178 miles long, but divided for working into two portions; first, from Baltimore to Harper's Ferry, 80 miles; second, from Harper's Ferry to Cumberland, 98 miles.

Baltimore to Harper's Ferry.

8 miles	rise from 30 to 40 feet per mile.
7 "	fall " 30 to 40 " "
2 "	rise at 82 " "
2 "	fall at 82 " "
46 "	rise and fall from 0 to 30 feet per mile.
15 "	level.
80 "	total length, with a total rise of 852 feet, and fall of 647 feet.
15 "	are curved with a less radius than 1000 feet.
	Total curvature, 31 circles of 360°.
80 "	of edge rail, 51 lbs. per yard.
30 "	of plate rail, 15 lbs. per yard, (portion of double track.)

Gross load for Engines weighing 23·5 tons—200 tons.

This load is regulated by the necessity for carrying it a portion of the distance on the plate rail. At the 82 feet grades assistant Engines are provided.

Harper's Ferry to Cumberland.

14 miles	rise from 30 to 40 feet per mile.
10 "	fall " 30 to 40 " "
33 "	rise and fall from 0 to 30 feet per mile.
41 "	level.
98 "	total length, and with a total rise of 998 feet, and fall of 634 feet.
1·6 "	are curved with a less radius than 1000 feet.
	Total curvature, 29 circles of 360°.
98 "	of edge rail, 51 lbs. per yard.

Gross load for Engines weighing 23·5 tons—275 tons.

The first successful effort to burn anthracite coal in Locomotive Engines was made upon the Baltimore and Ohio Railroad in 1831, by Phineas Davis, of York, Pennsylvania, in a small Engine built by him, having an upright boiler; the weight of this Engine was 3·5 tons, and was capable of transporting 15 tons at fifteen miles per hour. The same plan of Engines was adopted and adhered to for this road until 1838, with modifications and improvements from time to time; chiefly consisting in an increase of their weight, 12·5 tons being the maximum. These Engines are now in successful operation, transporting merchandize and passengers, and show themselves quite equal to compete with those of larger and later construction. In 1833 the Engine *Atlantic*, weighing 6·5 tons, with 4 tons on the driving wheels, ran 13,280 miles, at 80 miles per day, with the consumption of 190 tons of anthracite coal. Gross load 23 tons. In 1834 the Engine *Arabian*, weighing 7·5 tons, on four driving wheels, consumed 1·25 tons of anthracite coal per trip of 80 miles. Gross load 45 tons. In 1840, when anthracite coal was abandoned for bituminous, a trial for two months was instituted in the same Engine, weighing 10·5 tons. Gross load 60 tons. This Engine ran to Frederick, distant 60 miles, and consumed 1 ton of bituminous coal to 1·25 of anthracite, and these results, I am told by Mr. Murray, held remarkably true throughout the trial. In 1840 and 1841, an accurate account was taken of the fuel consumed in eight wood and eleven coal-burning Engines. The wood-burning Engines weighed each 10 tons, with 6·5 tons on a single pair of driving wheels. The coal Engines weighed 9·75 tons on two pair of driving wheels.

8 Wood Engines, running 78,443 miles, consumed 2023 cords pine wood.
11 Coal “ “ 77,382 “ “ 1597 tons bituminous coal.
Wood consumed per trip of 80 miles with 40 tons gross load, 2·05 cords.
Coal “ “ 80 “ “ 60 “ “ 1·65 tons.
Proportion of coal to wood consumed per load taken, 1 ton to 1·87 cords.

No further additions were made to the stock of coal-burning Engines on the Baltimore and Ohio Railroad until 1844, the road then being open to Cumberland. In October of that year, Ross Winans produced the first successful coal-burning Engine with a horizontal boiler; for the Baltimore and Ohio Railroad, like the Reading Road, had made an unsuccessful effort to burn anthracite coal in an Engine built for them by Eastwick & Harrison, with a horizontal boiler, similar to the Engines furnished by the same parties to the Beaver Meadow and Hazleton Roads. Of the Engines built by Ross Winans, with horizontal boilers, six were placed upon the road between October, 1844, and July, 1845, and six others between July and December, 1846. One other Engine, substantially like these, but built by the company, was placed upon the road in May, 1847.—These thirteen Engines weigh each 23·5 tons, and have eight driving wheels 33 inches in diameter. Speed is attained through the medium of cog-gearing. The first six Engines were without copper fire-sheets, but renewed with copper after one year's service with the iron. The later built Engines were all constructed with copper fire-sheets.

The coal consumed by these Engines in 1845, was 3·25 tons between Baltimore and Harper's Ferry, with a gross load of 200 to 250 tons. In September and October, 1848, twenty-four trips were made with the same Engines on the upper or Cumberland end of the road, and thirty trips on the lower or Baltimore end of the road, for the purpose of testing the value of different coals. Average gross loads between Baltimore and Harper's Ferry, 200 tons, coal consumed, 2·25 tons per trip of 80 miles. Average gross loads between Harper's Ferry and Cumberland, 275 tons, coal consumed, 2·5 tons per trip of 98 miles. For a more ready comparison of the results which are known of the consumption of fuel on the Baltimore and Ohio Railroad, I have placed them in the following table:—

Table Shewing the Amounts of Fuel Consumed on the Baltimore and Ohio Railroad, at Different Periods from 1833 *to* 1848.

Date.	Weight of Engine on driving wheels.	Position of boiler.	Gross Loads.	Miles Run.	Fuel Consumed.
1833	4·00 Tons.	Upright.	23 Tons.	80	1·15 Tons Anthracite.
1834	7·50 "	"	45 "	80	1·25 " "
1838	8·50 "	"	50 "	60	1·50 " "
1840	10·50 "	"	60 "	60	1·25 " "
1840	10·50 "	"	60 "	60	1·00 " Bituminous.
1841	9·75 "	"	60 "	80	1·65 " "
1841	6·50 "	Horizontal.	40 "	80	2·05 Cords of Wood.
1841	19·33 "	Upright.	140 "	80	3·13 Tons Bituminous.
1841	8·25 "	Horizontal.	60 "	80	3·13 Cords of Wood.
1845	23·50 "	"	225 "	80	3·25 Tons Bituminous.
1848	10·50 "	Upright.	60 "	80	1·25 " "
1848	10·00 "	Horizontal.	60 "	80	1·03 " "
1848	10·00 "	"	60 "	80	2·75 Cords of Wood.
1848	10·00 "	"	60 "	80	1·58 Tons of Coke.
1848	23·50 "	"	200 "	80	2·25 " Bituminous.
1848	23·50 "	"	275 "	98	2·50 " "

1 Ton of Bituminous Coal = 1·25 Tons Anthracite Coal.
1 Ton of Bituminous Coal = 2·12 Cords of Wood.
1 Ton of Anthracite Coal = 1·75 Cords of Wood.

The cost for repairs of the large coal Engines on the Baltimore and Ohio Railroad, I am able to give with much accuracy; the annual reports furnish some of this information, but to Mr. Perkins, the Master of Machinery, I am indebted for details.

In 1847, the thirteen large coal Engines ran each 16,000 miles; in 1848, they ran 17,000 miles, and cost for repairs $1777 each; of this sum, however, a portion is due to the geared construction, which adapts them to the short curves of this road, but that which is due to coal-burning is as follows: Cost for renewing the fire-sheets of 23·5 tons Engines on the Baltimore and Ohio Railroad, after deducting for old copper, $300. Area of fire-grate, and amount of copper in fire-place, one-third less than Reading coal Engines. This difference in the amount of copper is not a necessary one, for the sheets of copper in the Reading Engines are wider, by ten inches, than the fire-sheets of the Baltimore and Ohio coal Engines, and do not extend above the grate a further distance.

In six of these large Engines, the copper fire-sheets were put in between November, 1845, and June, 1846, and one only has been renewed since; and, from their present appearance, there is no reason to doubt their lasting through this year. In giving the extra cost for repairs of these Engines, $100 per year is taken to cover the destruction to the fire-box.

Extra Cost per year, over Wood Engines, for each 23·5 *ton Coal Engine on the Baltimore and Ohio Railroad, from the use of Bituminous Coal.*

Cost for renewing fire place, ...	$100·00
2 setts of grate bars, 1000 lbs. cast iron, at 2½ cents, .	25·00
Renewing ends of tubes, caulking, &c., ...	100·00
Extra work, caulking, &c., ...	25·00
	$250·00

In 1842, the Western Railroad Corporation of Massachusetts, purchased seven large coal-burning Engines of Ross Winans; these Engines were on eight driving wheels thirty-three inches in diameter, and geared for speed; weight of Engines, 20 to 23 tons; boilers upright; area of grate, 24 feet. In April of the same year, the Engineer of the Road, by an order of the Board, had trials made for five successive days with the Engine *Maryland*, weighing 20 tons, for the purpose of ascertaining the quantity of fuel consumed. These trials were made on that portion of the road between Albany and Springfield, distance 100 miles. In running 500 miles with fair loads due to the adhesion, the consumption of fuel (anthracite coal) was 2·5 tons per trip of 100 miles. The large wood-burning Engines on that road, weighing 20 tons, with 14 tons on four driving wheels, (when drawing their load,) consumed four cords of wood per trip of 100 miles. This comparison of wood and coal shows 1 ton of anthracite coal to be equal to 2·26 cords of wood; a comparison more favorable to anthracite coal than any I know of. The upright boiler, however, of these Engines, with their large area of grate, were well adapted to burn anthracite coal; while the hemlock wood used on this portion of the Western Railroad was an inferior fuel to the mixture of pine and oak common in this section of the country.

The use of anthracite coal was continued in these Engines until the close of the year 1842, when, from motives of economy, (cost of coal $7 per ton, and wood $3 per cord,) and to ensure greater regularity on a long line of road, with a single track and a heavy business, (which the want of experience in the use of this fuel in some degree prevented,) coal was abandoned for wood. As wood-burners, these Engines were not economical; and as the upright boiler was a source of considerable expense, owing to the sediment which collected on the tube-head, they were, in 1846, placed in ordinary and other Engines substituted on the road.

The Beaver Meadow Railroad is fourteen miles long from the foot of its inclined planes, where it is intersected by the Hazleton Railroad, to its terminus at Mauch Chunk. The grades of this road are eighty feet per mile, till it strikes the Lehigh river, distant five miles; and from this point to Mauch Chunk (nine miles) the road falls with the river from twenty to fifty feet per mile; it has short curves and is laid with a light plate rail.

There are six Engines on the road burning anthracite coal, they weigh about fourteen tons, with ten tons on four driving wheels. The first Engine was placed upon the road in 1837, and was built by Garrett, Eastwick & Co. Loads for engines up the grade, forty-five tons gross, exclusive of Engine and tender (seventeen tons). The work is done upon this portion of the road with three Engines, each running daily seventy miles during twelve hours, and the fuel consumed is about 2·75 tons of anthracite coal per Engine. Gross load per round trip of 28 miles, 230 tons.

The Hazleton Railroad, from Hazleton to its intersection with the Beaver Meadow Road, is nine and a half miles long, and from this point to the Lehigh river at Penn Haven, (five miles,) the Beaver Meadow Railroad is used in common by the two companies. The grades upon the first four miles of the road from Hazleton are light; then descending at sixty feet per mile for four miles; and then at one hundred and forty feet per mile for one and a half miles, to its intersection with the Beaver Meadow Road;

the loads up the one hundred and forty feet grade are divided. The remaining five miles over which the Hazleton Company carry their coal, falls at eighty feet per mile to the Lehigh river. Road laid with plate rail and short curves. Engines similar to those on the Beaver Meadow Road; first one went to work in 1839. Number of Engines at work each day, loads taken, miles run, and fuel consumed, same as Beaver Meadow Road.

The cost for repairs of Engines on these two last-named roads, I am not able to give; but as experience shows that the fire-boxes (which are of iron) last from five to six years, the extra cost for repairs due to the use of anthracite coal would appear very immaterial. There are, however, considerations which should be taken into account in judging the value of the results in the use of coal on these roads. During the three winter months, these roads are not worked, and the amount of fuel consumed is about two-thirds of that consumed in the Engines on the Reading Road in the same working time. The short run (not exceeding fourteen miles) also enables a thin fire to be kept, which is cleared of cinder at each end of the road, while the Engine is being turned and attached to its return load; but, before starting, it becomes necessary to replenish the fire-place with wood, and thus a new fire is kindled every few hours in the day. This system is quite practicable on roads where the consequent delays are not felt, but entirely inapplicable to the Reading Road.

To be Continued.

Report to the President and Directors of the Ohio and Pennsylvania Railroad Company. By SOLOMON W. ROBERTS, *Chief Engineer.*

Continued from page 21.

From Mount Union to Canton, Massillon, Wooster, and Mansfield.

From Mount Union to Wooster the distance is 50 miles, and the road will open a country which, for the production of wheat, is, perhaps, unequalled in America. It runs through the heart of Stark and Wayne counties, passes by the important town of Canton, the county seat of Stark, and, at the distance of 101 miles from Pittsburg, crosses the Ohio canal at Massillon, the great wheat mart of Ohio.

As the immense trade of Massillon has always sought the New York and Boston markets, it strikes the minds of most persons with surprise when they are first informed that the place is only 101 miles from Pittsburg.

By official returns, it appears that in 1847 there were shipped, at Massillon, upon the Ohio canal, the almost incredible amount of 1,489,697 bushels of wheat; besides 55,669 barrels of flour; 45,139 bushels of corn; 202,719 pounds of wool; 73,889 pounds of leather; and 37,388 pounds of eggs.

The whole amount of flour and grain shipped coastwise from Cleveland, in 1847, was 2,066,484 bushels of wheat, and 701,870 barrels of flour.

The arrivals at Cleveland by the Ohio canal, in 1847, were 644,913 barrels of flour and 2,130,317 bushels of wheat; and there were cleared at that port upon the canal, in the same season, upwards of *fifteen millions* of pounds of merchandize.

At the town of Akron, about twenty-five miles north of Massillon, where the "Pennsylvania and Ohio Canal" ends, the shipments were 231,221 barrels of flour, and 589,376 bushels of wheat.

If any one will attentively consider the statistical returns of the production and shipment of produce in Ohio, he cannot fail to see that our line runs *through the heart* of that region which raises the largest supply of the "staff of life." We need no long branches to reach it, but we pass right through it. It is the granary of the State; and, while it is a grain region, it is also a coal region. The country south of the Sandy and Beaver Canal is much more hilly and greatly inferior in its surplus productions.

Salem contains a remarkably enterprising and thrifty population of about 1500; and Canton, Massillon, and Wooster, are flourishing and improving towns of about 3000 people each. Our "back-bone line," passing through them, will benefit them more than could possibly be done by any other enterprise.

Canton is the county town of Stark, and Wooster of Wayne county. Stark stands *first* in the list of the counties of Ohio for the production of wheat; the amount raised in 1840 having been 753,977 bushels; and in 1846 it reached 989,808 bushels. No doubt it now much exceeds a million.

The amount given in the statistical tables, in 1840, was, for Wayne county, 753,621 bushels, and it stood *second* in the list; while Columbiana raised 435,834 bushels of wheat, being the eighth in order; but it stood *first* for the production of wool, and raised 215,426 pounds.

The remaining county on our line is Richland, Ashland having been recently formed. The county town of Richland is Mansfield, 164 miles from Pittsburg by our railroad. The wheat raised in the county in 1840, was 506,585 bushels, and the amount of other productions was large.

The *population* of the four counties, in 1840, stood as follows: Columbiana 40,378, Stark 34,603, Wayne 35,808, and Richland 44,532; making an aggregate of 155,321. Omitting Hamilton county, which includes the city of Cincinnati, *Richland stands first in population among the counties of Ohio, and Columbiana second.*

These facts show the character of the country through which our line passes; they show that the *local trade* along it will justify its construction; and that we may safely and proudly challenge a statistical comparison with any line of equal length that can be drawn westward from the eastern boundary of Ohio.

These counties have greatly increased in population and wealth since 1840, and their present valuation of taxable property is about thirty millions of dollars.

To complete and bring into successful use a good railroad, with a heavy iron track, from Pittsburg to the point of intersection with the Columbus and Cleveland road, twelve miles west of Mansfield, a distance of 176 miles, will probably cost about three millions of dollars.

In view of the importance of the work, and of the trade which it will command, the use of a heavy iron track is, in my opinion, essential. Such a track costs about ten thousand dollars per mile.

At Mansfield we connect with the Mansfield and Sandusky City Railroad, 56 miles in length, which was opened for use in June, 1846. In 1847, that road carried 504,081 bushels of wheat, 62,598 barrels of flour, with a large amount of other articles; and its *net earnings* were $61,406·03.

The Directors, in their Report, say: "The construction of this road has given an impetus to Mansfield and the surrounding towns, together with the towns upon the line of railroad, and to Sandusky city, which far exceeds the estimate made three years ago by our most sanguine friends." "It has also created an interior market for the farmer, and, on an average, *has doubled the value of his surplus products*, and made such marketable as were not of cash value before; has cheapened all that he consumes, in the line of staples and domestics, one-half their former cost, and has greatly increased the value of real estate, where its effects have been felt."

Similar results have attended the construction of the Little Miami and Mad River Railroads, and all these works are highly profitable investments. The *net earnings* of the Little Miami Road, in 1848, were $146,072·48, being ten per cent. on the capital stock. Similar results may confidently be predicted upon our road.

A very extensive and elaborate series of surveys has been made between Wooster and Mansfield, a distance of about 39 miles. Three routes, with a number of subordinate lines, have been examined, each of which routes has peculiar advantages, especially with reference to the accommodation of local interests; and all the facts bearing upon the question should be fully reviewed and considered by the Board before a determination is made.

But whatever conclusion may be come to on this subject, it is clear to my mind, that the importance of a connexion between Wooster and Columbus, by the way of Mount Vernon, should never be lost sight of. With that connexion once secured, we shall be in a position to compete successfully for the Cincinnati travel with any other road that can be made between Pittsburg and Cincinnati; the whole distance between those cities being 330 miles, by a route passing through a country of unparalleled productiveness. This connecting link will be of vast advantage to the citizens of Mount Vernon, and of Knox county; the distance from Wooster to Mount Vernon being 47 miles, and thence to Columbus 40 miles. Should the southern route between Wooster and Mansfield be adopted, but little over 20 miles of road will complete the connexion with Mount Vernon.

Our line, running out westward over the table lands to Wooster, and thence turning south-westward in the direction of Columbus, runs nearly parallel with the Sandy and Beaver and the Ohio Canals, but at a distance from them, and is much straighter than they are, not being confined in crooked valleys. Our railroad route from Pittsburg to Columbus is 25 miles shorter than the river and canal boat route by Glasgow, Bolivar, and the valley of the Tuscarawas to Newark, combined with the proposed railroad from Newark to Columbus. We run through the heart of the rich farming region, having a tributary country on both sides, and we do not come into direct competition with any canal or other public work already constructed.

One of the great advantages of a railroad is that, unlike a canal, it need not seek large supplies of water or the lowest levels. It need not be exposed to inundations, and, by establishing its depôts in the richest districts of the country, it saves to the producer a large part of the expense which he must otherwise incur in hauling his produce to water communications.

A bushel of wheat, when taken from Massillon to New York by the usual canal, lake, and river communication, is carried 770 miles, and a long period elapses before returns can be received. By our railroad route, the distance from Massillon to New York will be 547 miles, and to Philadelphia 459 miles, and returns can be received without delay. On the Boston and Albany Railroad vast quantities of flour are carried, with great promptness, 200 miles, for thirty cents a barrel. The railroad being open twelve months in the year, while the canal is open but eight, the former has an advantage over the latter of fifty per cent. in the period of its usefulness.

The country around Rochester is emphatically the wheat region of New York, as that around Massillon is the wheat region of Ohio. The New York wheat-grower now has an advantage of about 350 miles over his Ohio competitor in transportation to the eastern markets; which, with a winter communication to Boston, makes his produce worth twenty per cent. more; but the construction of our road will put them, as nearly as may be, upon a par in distance to the seaboard, and also in the possession of a winter communication.

The Importance of the "Ohio and Pennsylvania Railroad," as a part of the General System of Railroads in the United States.

Internal improvements are among the main elements of the commercial power of a nation. When they are wisely and well executed they confer upon it vast advantages and lasting honor. Their moral benefits go hand in hand with those of a commercial character; and railroads especially, by facilitating personal intercommunication, break down the barriers of prejudice, and bind together in a common bond the citizens of the most widely extended communities. Those works, by which we achieve our peaceful victories over space and time, become enduring monuments of the intelligence of the generation by which they were planned and constructed.—Practically, they lengthen life, for they enable more to be done in the same period; and they quicken and facilitate the movements of those whose high mission it is, in various ways, to instruct and to improve their fellow men. It has been well said by Macauley, in writing the History of the Progress of England, that next to the alphabet and the printing press, those inventions that abridge distance have done most for the civilization of our species.

When we look upon a map of the United States, we are struck with the position of the State of Pennsylvania. With its eastern border washed by the tide-waters of the Atlantic, it stretches westward to the head of the Ohio river at Pittsburg, and to the shores of Lake Erie. No other State combines these advantages. Directly west of Pennsylvania are the great grain-growing States of Ohio, Indiana, and Illinois, and their shortest route both to Philadelphia and New York lies through her territory.

For a series of years the State of Pennsylvania enjoyed the advantages of her geographical position by means of a system of turnpikes. But the opening of the Erie Canal, of New York, in 1825, changed the face of affairs, and transferred the advantages of the western trade to that State. In the following year Pennsylvania began her canal system, but the Allegheny range divided her territory, and prevented her canals from being continuous.

In 1830, land carriage received its most signal improvement by the successful opening of the Liverpool and Manchester Railway in England. By the combination of the fire-tubes with the blast-pipe, the "Rocket" engine became the parent locomotive of an innumerable race; and this invention, combined with that of rolled iron railroad rails, created a new era in inland transportation.

The legislature of Pennsylvania, at its next session, determined to take advantage of the new improvement, for the purpose of uniting her canals by scaling the Alleghenies, and, in the spring of 1831, the writer of this Report was appointed to lead the exploring party in locating the Allegheny Portage Railroad.

Although that road was made in the infancy of the railroad system, its opening, in 1834, was of vast advantage to the State and to the Union. But the line between Philadelphia and Pittsburg, being made up of an alternate system of canals and railroads, is attended with many disadvantages, and burthened with the expense of repeated transhipments. These evils will speedily be remedied by the Pennsylvania Railroad, now in course of construction, in the best manner, and with the aid of all the lights of the experience of the past.

Following nearly the fortieth parallel of north latitude, the dividing line of the population of our country, it will be the "*Central Railroad*" of the Union, and the Ohio and Pennsylvania Railroad, or "back-bone line," will be its extension westward from Pittsburg over the fertile plains of Ohio.

In 1788, Ohio was a wilderness, with no permanent white population. Since 1830, its population has increased, in round numbers, from one to *two millions of people;* and the great free States, to the west and northwest of it, have increased, and are increasing, in population and wealth with unexampled rapidity.

The charter of the Ohio and Pennsylvania Railroad Company is of the most liberal character, and will enable the Directors to pursue the policy best adapted to add to the value of the stock, and to protect and promote the interests of the stockholders; which is the only safe policy for such a Corporation.

Neither the time for the completion of the work, nor its western terminus is fixed by law, and, under its charter, this Corporation may either extend its operations to the western boundary of Ohio, or may content itself with connecting with some of the other railroads in the western part of the State. Our surveys have been extended to Bucyrus, the county town of Crawford county, 24 miles west of Mansfield, which is an important point; but it would be premature, at this time, to express an opinion as to the relative importance of the various extensions of our road beyond Mansfield, which will, sooner or later, be made.

By connecting with the Mad River Railroad at Kenton, we may obtain a connexion with Cincinnati, making the distance from Pittsburg about

360 miles; or nearly the same as that by the intersection of the Columbus road beyond Mansfield, and about 30 miles more than by the cut off connexion from Wooster to Mount Vernon and Columbus. Our road will thus intersect three lines leading to Cincinnati, besides being connected with Newark by the Mansfield and Newark Road, now nearly completed.

The railroad distance from Kenton to Bellefontaine is 24 miles, and at that point comes in the important road now in progress of construction, from Bellefontaine to Indianapolis, a distance of 140 miles, 83 of which are in Indiana. There is a railroad now in use from Indianapolis to Madison, a distance of 86 miles, which makes dividends of *fourteen per cent.* per annum, and the stock of which is much above par.

From Indianapolis to St. Louis, by the general route of the National Road, crossing the Wabash at Terre Haute, will be about 250 miles, passing through a highly productive country, and making the whole distance from Philadelphia to St. Louis about 990 miles. A more northerly line from Kenton westward, crossing the Wabash at Lafayette, is also projected.

The present importance of St. Louis need not be dwelt upon, and one of the proposed railroads to the Pacific will probably start from that point.

The Ohio and Pennsylvania Railroad will not only command a greater amount of local trade and travel than any other road in Ohio, stretching in the same direction, can do, but it will afford excellent connexions with Cincinnati and St. Louis, by lines running through the most populous parts of the country.

Combined with these advantages, it has, in addition, the remarkable characteristic of forming a part of the best railroad connexions with Cleveland, Sandusky, and Toledo, on Lake Erie, and, by means of the "Ohio, Indiana, and Lake Michigan Railroad," with the city of Chicago, and the vast and growing empire of the north-west. This includes northern Indiana and Illinois, and southern Michigan; and, by means of the Chicago and Galena Railroad, the States of Wisconsin and Iowa, the Territory of Minesota, and the wide expanse of territory still further west. The distance from Philadelphia to Chicago will be about 850 miles.

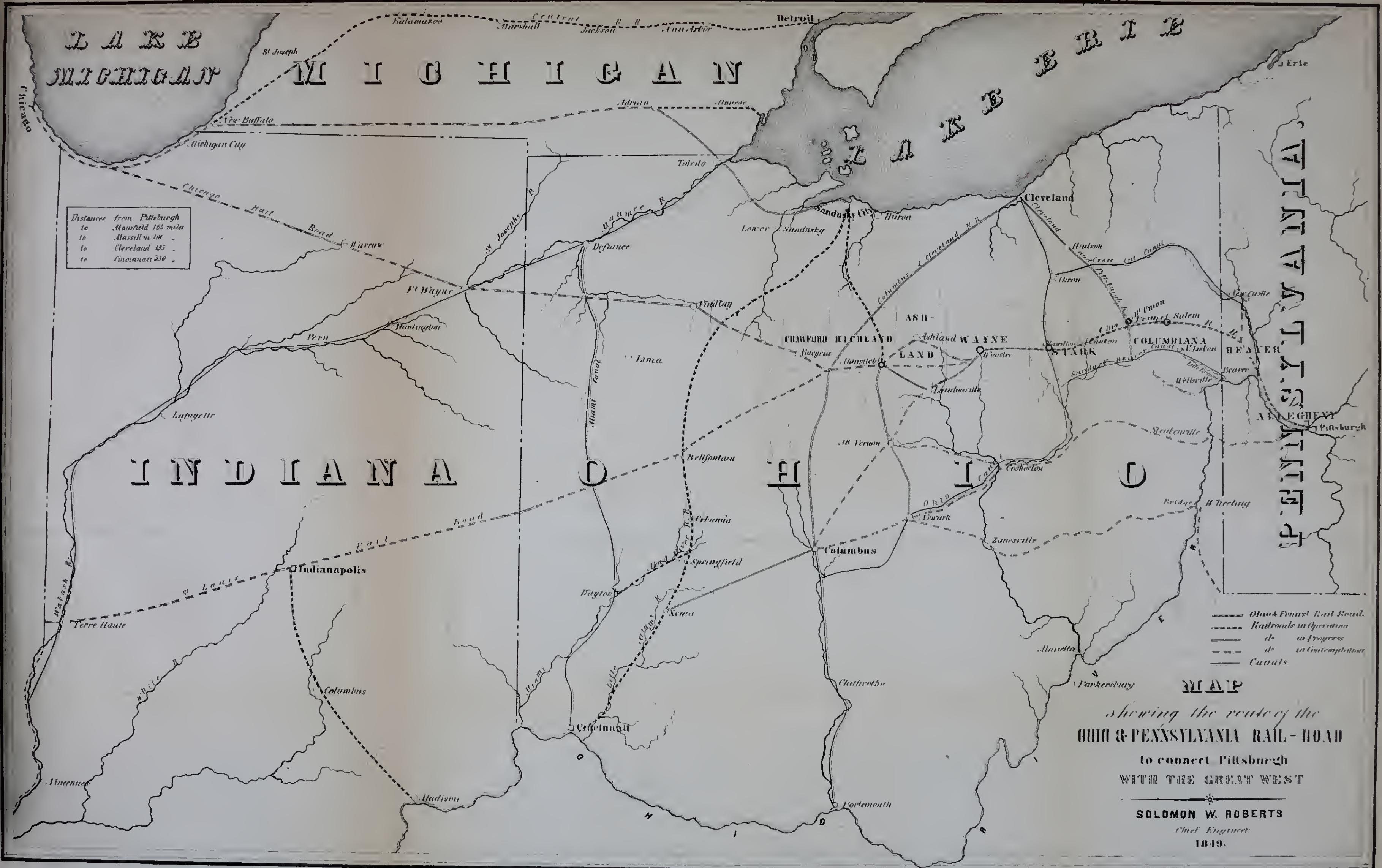
To my mind it is clear that the inducements to capitalists, and the prospects of benefit to the public, presented by the "Ohio and Pennsylvania Railroad," or "back-bone line," can scarcely be surpassed.

In concluding this Report, it gives me pleasure to express my entire satisfaction with the manner in which the Resident Engineers, Mr. Jesse R. Straughan and Mr Edward Warner, have fulfilled their duties. They have shown themselves to be gentlemen well worthy of the trust which has been confided to their care.

The outline of this, my first Report as Chief Engineer of the Ohio and Pennsylvania Railroad Company, based upon the preliminary surveys, was drawn up at Pittsburg, in January, 1849.

Respectfully submitted,

Solomon W. Roberts,
Civil Engineer.



Distances	from Pittsburgh	
to	Mansfield	164 miles
to	Massillon 101	„
to	Cleveland 135	„
to	Cincinnati 330	„

MAP
showing the route of the
OHIO & PENNSYLVANIA RAIL-ROAD
to connect Pittsburgh
WITH THE GREAT WEST

SOLOMON W. ROBERTS
Chief Engineer
1849.

AMERICAN PATENTS.

List of American Patents which issued in the month of September, 1848, *with Exemplifications by* Charles M. Keller, *late Chief Examiner of Patents, in the U. S. Patent Office.*

1. For an *Improvement in Calculating Machines;* J. J. Baranowski, of the Empire of Russia, September 5; in France, 25th November, 1847.

The patentee says,—"My invention consists of a commercial table or ready reckoner, containing the various results previously calculated and arranged, consecutively in units, tens, hundreds, &c., as well as in fractional parts when desired; of suitable apparatus for bringing the numbers of such table into view; of a face plate with openings formed in it, to admit of any portion of such commercial table or ready reckoner being seen when required; and lastly, of a number of accurately filled slides, any number of which can be withdrawn for the purpose of exhibiting the numbers constituting the required result; the other numbers not required for the result to be ascertained being concealed from view. The slides and the face plate are so adapted and arranged, that the operator may readily see from the front of the machine which slide to withdraw, in order to disclose any result required."

Claim.—"What I claim as my invention, is a ready reckoning machine, constructed and arranged substantially as set forth, so that commercial tables or ready reckoners may be used and read for the purpose for which they are intended, by bringing into view, by a simple mechanical operation, such of the symbols or numbers only as are necessary for, or form part of, the particular calculation or result to be ascertained, the rest of the numbers on the table being at the same time concealed from view."

2. For an *Improvement in Cutting Veneers into Figures;* Joseph Fielemeier, Philadelphia, Pennsylvania, September 5.

Claim.—"What I claim as my invention, is, 1st, The combination of the clamp plates, for holding the veneers, with the cutters and the block or stock to which they are attached, as set forth.

"2d, I claim the combination of the movable plates and screws, for operating the clamp and cutters, with the fixed head and arms, secured to the base or platform by the combined posts and vertical guides, as set forth.

"3d, I claim the combination of the leaden, iron, and wood plates with the steel spring cutters bedded into the leaden plate, as set forth."

3. For an *Improvement in the Method of Setting Steel Traps;* Warren Jenks, Schroon, Essex county, New York, September 5.

The patentee says,—"The nature of my invention consists in causing both of the hooks made fast to the trap to be thrown forward by the spring, either in a horizontal or perpendicular direction, so that when the animal springs the trap by taking the bait on the middle hook, the lower hook will be forced into the throat beneath the under jaw, and the upper one into the head or neck on the upper side, thus penetrating until they meet at the points; or, if sprung by passing over it, that the hooks will be forced into the body of the animal on each side."

Claim.—"What I claim as my invention, is the form of the hook, and the manner of setting the trap by the use of said hook, constructed and operating substantially as set forth."

4. For an *Improvement in Compound Rail for Railroads;* Benj. H. Latrobe, Baltimore, Maryland, September 5.

The patentee says,—"My rail is composed of three parts, by which I secure an approximation to a uniformity of strength in the combined bar, by breaking the joints at two points instead of one, which is all that can be effected by the former modes; and it can be applied in many cases where the other could not."

Claim.—"What I claim as my invention, is the combination of the cap rail and base rails, substantially in the manner and for the purposes set forth."

5. For an *Improvement in Ploughs;* John Ormiston, Waterford, Washington county, Ohio, September 5.

Claim.—"What I claim as my invention, is, 1st, The combination of the notched plate and slotted hook stop, for adjusting and holding the point, and the manner in which the point passes through the front piece, and is regulated by the notched plate and dog or stop; and in combination therewith, I claim the tubular nose, made with a flanch or cutter, as set forth."

6. For an *Improvement in the Portable Lock;* Alonzo Perry, City of New York, September 5.

The patentee says,—"The nature of my invention consists in the construction of a lock to be used generally in the place of a common padlock, the said lock forming the clasp or strap itself, with neat screw connexions or fastenings instead of staples; the lock to be used as a wrench to insert the catch in its proper place, as well as to fix the screw with which it is connected at its butt into the door post or frame."

Claim.—"What I claim as my invention, is the combination of the fast and loose screw fastened with the lock, so arranged that the lock itself may be used as a wrench to insert the screws or fastenings of said lock into the door or post as the case may be, the whole to form a portable lock in the manner set forth."

7. For an *Improvement in the Self-Acting Railroad Switch;* Edward J. Stearns, Ellicott's Mills, Ann Arundel country, Maryland, September 5.

The patentee says,—"The nature of my invention consists in so arranging one end of a self-adjusting railroad switch, that the manager or engineer of a locomotive, or any other railroad car, may direct the train from the main track to a branch track, by moving a lever attached to the locomotive or cars, and in so arranging the other end of the switch that it may be operated by the flanches of the wheels when passing from the branch to the main track, or otherwise."

Claim.—"What I claim as my invention, is the application and hanging of the switch-rail, so as to turn horizontally on a pivot, as set forth, in combination with the horizontal lever beneath the flat plate, and the spring acting upon it, and through it, upon the switch rail, and thus keeping the switch-rail pressed against the narrow end of the tapering rail, when the cars are not passing through; also, in combination with the tilting frame below, and the flanch levers resting upon it at one end, and the crowning levers at the other, and the arranging of these latter levers so as to arrest the long arm of the one or the other of the horizontal levers, and thus hold fast the one or the other of the switch-rails, according as the one or the other side of the tilting frame is depressed by a movable lever attached to the locomotive or car, pressing on the one or the other of the crowning levers in going towards the turnout, or by the flanch levers at the other end of the frame in coming back on the one or the other track, as set forth."

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8. For an *Improvement in Axletrees;* Jonathan W. Whitney, Buffalo, Erie county, New York, September 5.

Claim.—"What I claim as my invention, is the combination of the cross standards with the axle, straining bar, and adjusting screws, substantially as set forth, for the purpose of accurately adjusting and gauging the track of the wheels, by giving to the points of the axles more or less inclination, the lower spokes of the wheels being thus kept in a perpendicular or inclined position as may be preferred."

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9. For an *Improvement in the Apparatus for Stretching and Drying Cloth;* E. B. Bigelow, Boston, Suffolk county, Massachusetts, September 5.

The patentee says,—"The nature of my invention consists in the employment of an endless chain of tenter hooks, for stretching and drying cloth over a series of steam pipes, or by air heated in any convenient way, instead of stretching the cloth on the stationary frames for that purpose, as set forth."

Claim.—"What I claim as my invention, is the endless chain of tenter hooks, constructed substantially as set forth, for conveying the cloth over the drying apparatus in the manner set forth.

"2d, I claim, in combination with the above, the series of steam pipes, or other equivalent device for drying the cloth as it is made to pass over them, as set forth.

"3d, I claim, in combination therewith, the steam cylinder for completing the operation when required, as set forth.

"4th, I claim the method of stretching the fabric on the tenter hooks, by causing the endless chain to be separated from each other as they move forward, as set forth.

"5th, I claim the employment of the wheels for fixing the cloth into the tenter hooks, as set forth."

10. For an *Improvement in the Cultivator Point;* Robert Criswell, Jr., Chambersburg, Franklin county, Pennsylvania, September 5.

Claim.—"What I claim as my invention, is the giving the sides of a cultivating shovel point, the one a forward, and the other a rearward curve, substantially for the purpose set forth."

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11. For an *Improvement in Pulp Machines for the Manufacturing of Paper;* Geo. Sweetland, New Haven, Connecticut, September 5.

The patentee says,—"My improvement consists in constructing a cylindrical vat, of suitable dimensions for the extent of the work intended to be done, with a circular curve near the bottom, extending about one-fourth of the diameter towards the centre of the cylindrical vat on all sides, or entirely round the lower part of the vat."

Claim.—"What I claim as my invention, is the combination of the bed and worker with their cutters, arranged horizontally in the bottom of a cylindrical vat, so as to cut or grind rags, straw, and other materials, (for making paper of every description,) into pulp of any even and suitable quality, by carrying the material in water through the machine, by means of the centrifugal force which is communicated to the water by the horizontal rotary motion of the worker, by which centrifugal force the water will be raised against the sides of the cylindrical vat, whence, by its own gravity, it will flow down to the centre, and through the hole or eye in the stationary wheel or bed, down to the worker, thereby keeping the material always loosely diffused through the water, and flowing with it through the machine continually, until the pulp is fit for use; the whole constructed, arranged, combined, and operating as set forth."

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12. For an *Improvement in the Mode of Incorporating Flocks with Flannel, &c.;* John M. Pratt, Dudley, Worcester county, Massachusetts, September 5.

Claim.—"What I claim as my invention, is the principle or mode of putting flocks into flannels and other cloths by means of rubbing them in with a cylinder and slats; and also the principle or mode of causing the flocks to fall on to the cylinder in even and uniform quantities, by means of the flock box and picker."

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13. For an *Improvement in Door Locks;* William Stephenson, Cincinnati, Hamilton county, Ohio, September 12.

Claim.—"What I claim as my invention, is, 1st, The application of a vibrating guard plate, in connexion with a yoke attached to the outer plate of the lock, constructed and operating substantially as set forth, so as effectually to close the keyhole of any lock on the outside, when locked on the inside, by the application of the key.

"I also claim the manner of constructing, arranging, and operating, substantially, the case for the key, with the spindles in said case, in connexion with opposite keyholes on each side of the lock, so that the key can be inserted from either side of the lock, and slipped over the same spindles, and when withdrawn from the outside of said lock, said spindles shall prevent the lock from being picked, as set forth."

14. For an *Improvement in Machines for Cutting Bungs;* Josiah Kirby, Cincinnati, Hamilton county, Ohio, September 12.

Claim.—"What I claim as my invention, is the application to making plugs for covering the heads of screws, nails, bolts, &c., used in ship building and other work, and plugs and bungs for barrels, of a cutter or hollow chisel, made so as to fit into a mandril by screw or otherwise, and bored out at the mouth to any given size, straight up far enough for the depth of a plug or bung, or to a given distance, then tapering into the centre so as to point the plug by compressing the end of the wood, a hole being bored through the whole length of the cutter, so as to admit a rod through to drive out the plug when cut. I also claim the application to making plugs and bungs of the combination of the mandril, cutter, driving rod, and separator, as set forth."

15. For an *Improvement in the Machine for Dressing Wooden Chair Seats;* Isaac Baker, Warwick, Franklin county, Massachusetts, September 12.

Claim.—"What I claim as my invention, is the mechanical method set forth of cutting the top faces of chair bottoms: that is, by a feeding frame having convex and concave guides, as set forth, and operating as set forth, in combination with a cylinder of curved knives and pressure rollers, arranged so as to move up and down as set forth, the whole mechanical arrangement being substantially as set forth."

16. For an *Improvement in Knitting Loom Needles;* William Bamford, Ipswich, Essex county, Massachusetts, September 12.

Claim.—"I claim the perforated hook or needle and the conductor, in combination with one another, and made to operate together, substantially as set forth. I also claim the conductor, in combination with the hooked rib needle, the whole being constructed and made to operate together, substantially as set forth."

17. For an *Improvement in Shingle Machines;* Miles R. Payne, Waldo, Delaware county, Ohio, September 12.

Claim.—"What I claim as my invention, is the combination of the wedge-shaped vibrating setting bar and spring setting arm, arranged and operating as set forth."

18. For an *Improvement in the Sliding Breech Pin and Self-Capping Gun;* Christian Sharps, Cincinnati, Hamilton county, Ohio, September 12.

The patentee says,—"The nature of my invention consists in the following particulars, viz., the construction to admit of a cartridge being inserted in the breech of the barrel, on a line with the bore; the breech slide cutting off the cartridge; its having a stationary tube with many caps; and the caps being put upon the nipple by the moving of the sliding breech."

Claim.—"What I claim as my invention, is the combination of the sliding breech with the barrel, the breech supporter, and the stock, in such a manner as that, when the sliding breech is forced down, the breech bore will be so exposed as to enable it to receive a cartridge on a line with the bore; and when the sliding breech is forced up, it will shear off the rear end of the cartridge, so as to expose the powder to the fire communication, and will firmly and securely close the breech bore, substantially as set forth. I also claim the combination of the cap-nipple with the sliding breech, substantially in the manner set forth.

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19. For an *Improvement in Washing Machines;* Stephen Baldwin, Williamson, Wayne county, New York, September 12.

The patentee says,—"The nature of my invention consists in constructting a washing machine having an oblong reservoir, in which, at a few inches below the bottom, is placed horizontally or transversely a fluted bed-piece, on which the clothes are laid, and over which a correspondingly fluted roller is moved by means of a sweep attached to its axle; and the application of water to the clothes whilst in the machine, in continuous small streams before and behind the roller, from a tank above, attached to the sweep or dasher and moving coincidently therewith, and with the roller."

Claim.—"What I claim as my invention, is the combination with the dasher of the washing machine, a tank for holding and supplying the wash water, substantially as set forth."

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20. For an *Improvement in Controlling Motive Power;* F. E. Sickles, City of New York, September 12.

The patentee says,—"The nature and character of my invention consists in making a connexion from the applying machinery to the driving machine, which is acted on by an operator in such a manner as that, by the motion of the operator, this regulating connexion will act on the applying machinery, and thereby regulate the amount of propelling force applied."

Claim.—"What I claim as my invention, is the use of the within set forth regulating connexion, to be acted on by an operator, and applied between and in connexion with applying and driving machinery, so as to regulate the amount of moving power, substantially on the principle and in the manner set forth."

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21. For an *Improvement in Door Locks;* William Stephenson, Cincinnati, Hamilton county, Ohio, September 12.

Claim.—"What I claim as my invention, is, 1st, the application of the circular revolving notched plate and the pins thereon, the slide and dog, constructed and operating as set forth.

"2d, I likewise claim the employment of the additional pin, inserted into the bolt, in combination with the pins in the revolving plate, arranged and operating in the manner set forth.

"3d, I also claim the application of the slide, in combination with the additional tumbler, constructed and operating substantially as set forth.

"4th, I likewise claim the combination and arrangement of the additional arm on the tumbler, in connexion with the circular revolving plate, arranged and operating in the manner set forth.

"5th, I claim the arrangement of the division plate, between the inner and outer key of the lock, to prevent the lock being picked when locked on the inside, as set forth."

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22. For an *Improvement in Machinery for Cutting and Arranging Paper;* J. C. Kneeland and G. M. Phelps, Troy, Rensselaer county, New York, September 12.

Claim.—"What we claim as our invention, is, 1st, making the table on which the sheets are piled with guide strips, as set forth, to adjust the two edges of the sheets widthwise, as they are received from the cutting machine, whereby the necessity of adjusting the sheets against a straight-edge by hand is avoided, and this we claim irrespective of the manner in which the sheets are transferred from the cutting machine to the table.

"2d, We claim the method, substantially as set forth, of adjusting that end of the sheets which first falls on the table, by means of the movable straight-edge called the check motion, substantially as set forth; and we also claim the method of adjusting the sheets, by the action of the other straight-edge against the other edge of the sheets, substantially as set forth; and we also claim the combined action of the two straight-edges, or check motion, acting alternately against the two ends of the sheets, substantially as set forth, whereby any defect arising from the defective action of the first is remedied by the second, as set forth.

"3d, We claim taking the sheets of paper from the cutting machine, and delivering them on to the table, by a motion taken from the rotating cutter, in the manner set forth, or in any other substantially the same, to insure the delivery of the sheets at the proper time."

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23. For an *Improvement in Shingle Machines;* William Smith, Bangor, Penobscot county, Maine, September 12.

Claim.—"What I claim as new, is connecting the lever, which rests on the shingle bolt to be sawed, with the carriage, in combination with the pawl and sliding rack, for throwing the feed pinion out of gear, substantially as set forth. I also claim the weights, arranged and combined with the levers, for causing the ends of the lever alternately to penetrate, and the hooks thereon to catch, in the manner and for the purpose set forth."

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24. For an *Improvement in Horse Powers;* Job Arnold, Freeport, Stephenson county, Illinois, September 12.

Claim.—"What I claim as my invention, is the method of regulating and rendering equable the motion of tread-wheel horse powers for driving machinery, by simultaneously changing the position of the adjustable beam on which the horses moving them pull, and the halter to which their heads are fastened, as set forth, by which they are compelled, without whip or driver, to perform a uniform amount of duty."

25. For an *Improvement in Double Bellows Pumps;* Daniel Deshon, Jr., and E. Z. Webster, New London, Connecticut, September 12.

The patentees say,—"The nature of our invention consists in arranging and constructing the parts so as to obviate difficulties and form a cheap permanent pump, in a compact form, and easily worked by the bather with a slight motion of his feet."

Claim.—"What we claim as our invention, is the combination and arrangement of the parts of the pump in the manner set forth, viz. by forming the base with a sufficient bevel each way for the motion of the platform, and forming thereby a space sufficient for the introduction of the water ways, as set forth, without occupying any more room than is necessary for the working of the pump."

26. For an *Improvement in the Theory of Ship Building;* James K. Howe, City of New York, September 19.

The patentee says,—"My improvement consists in a method of giving to the outline or external shape of the hull of the vessel or boat, of whatever size may be required, the form of arcs of circles, in combination approaching or resembling elliptical lines, and of ellipses, under certain rules and relative proportions; and these circles or ellipses are to be applied, as well to the lateral shape and position of the sides or ribs of the vessel, as to the shape of the under side or bottom of the vessel, measuring on a line following the keel from stem to stern."

Claim.—"What I claim as new, is the method of determining the configuration of vessels of all sizes, by describing the outline of the bottom, or what I call the 'dead rise,' by two arcs of unequal circles or ellipses, which meet on the upper edge of the keel, (which is their common tangent,) at what I call the 'central point,' in combination with curves or arcs of circles or ellipses described as aforesaid, and forming the outline of the ribs, all the ribs in the same vessel being segments of the same curve, and set upon or along the curve of the 'dead rise' fore and aft, the transverse planes in which the ribs are placed coinciding with planes radiating from the centres of the circles or ellipses of which the curves of the 'dead rise' are segments."

27. For an *Improvement in Refrigerators;* Thomas B. Smith, Philadelphia, Pennsylvania, September 19.

Claim.—"What I claim as my invention, is the application to refrigerators of the doorway and non-conducting partitions, to obtain entrance without affecting the temperature inside, as set forth, in combination with said refrigerator the employment of pipes or valves to admit cool air into the adjacent rooms."

28. For an *Improvement in Sizing and Drying Cotton Batting;* Henry A. Stearns, Cincinnati, Hamilton county, Ohio, September 19.

The patentee says,—"The nature of my invention consists in providing two parallel metallic rollers for sizing, one of which is hung on a frame which is movable, so as to allow a small stick, with the cotton battin attached, to be passed between the rollers to be sized on both sides; also, a long narrow drying chamber, heated by steam pipes, through the whole length of which the cotton batting, when sized, is made to pass slowly, by resting the two ends of the said sticks upon or across two endless belts, which pass through its whole length, all of which is done by one operator."

Claim.—"What I claim as my invention, is, 1st, the attaching one of the rollers to a movable frame, bringing it in contact with the other roller either by its own weight or a spring, thus allowing the stick to be passed between the two rollers, and causing the movable roller to close again immediately upon the batting which follows the stick.

"2d, The attaching of each piece of cotton batting to a stick, and the passing the stick with the cotton attached between the rollers.

"3d, The placing of the long narrow drying chamber, with its open mouth within reach of the operator, having two endless belts passing through its length, upon which the operator can place the two ends of the stick containing the cotton wadding, and subject it to immediate heat, and cause it to be conveyed slowly through the entire length of the drying chamber without further trouble.

"4th, I claim the combination of the three foregoing items, viz. the movable roller, the passing of the stick between the two rollers, and the passing of the sized wadding immediately through the drying chamber by means of endless belts, as a new and improved mode of manufacturing cotton wadding."

29. For an *Improvement in Steam Hammers;* Lewis Kirk, Reading, Berks county, Pennsylvania, September 19.

Claim.—"What I claim as my invention, is combining a horizontal steam engine with the helve of a hammer, by means of an arm and jointed link, or its equivalent, substantially as set forth."

30. For an *Improvement in the Ice Cream Freezer;* Anthony H. Austin, Baltimore, Maryland, September 19.

Claim.—"What I claim as my invention, is the employment of the combined concentric circular planes and dashers, in combination with the freezing apparatus, made as set forth, said planes operating in the manner set forth."

31. For an *Improvement in Apparatus for Rotting Hemp;* Charles H. Van Dorn, St. Louis, Missouri, September 19.

The patentee says,—The nature of my invention consists in heating the water in the hemp and flax vats, by passing tubes of hot air through them, and then causing the heated air to enter the drying room where the hemp or flax is dried, thus using all the heat from the furnace, and economically rotting and drying the hemp or flax to prepare it for breaking."

Claim.—"What I claim as my invention, is the employment of heated air in the manner set forth, for heating the vats, for rotting the hemp or flax, and then passing said heated air into the drying room, for drying the hemp or flax that has been rotted preparatory to breaking, by which a great economy of heat is effected. I also claim placing regulators in the vats, for keeping the water at the proper temperature, combined and connected with the valves or dampers in the chimney and heated pipes, as set forth, so that, by increasing or diminishing the heat, the dampers shall be opened or closed as set forth."

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32. For an *Improvement in Hulling Wheat preparatory to Grinding;* Saml. Bentz, Boonsboro', Maryland, September 19.

Claim.—"What I claim as my invention and discovery, is the effectually and practically removing the outer coating of wheat and rye by the process set forth, before it is submitted to the grinding operation, whether effected in the precise manner and by the exact means set forth, or in any other way substantially the same."

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33. For an *Improvement in the Window Fastener;* James W. Evarts, New Haven, Connecticut, September 19.

Claim.—"What I claim as my invention, is the combination of the parts, by making the fastener in such a manner as that the button, bolt, or catch, and the spring which moves and sustains it, shall be enclosed in a small, snug, and neat case; with the wards in the case so arranged and formed that, by turning the button, bolt, or catch, to fasten the sash, it will (by means of the spaces or grooves in the button, bolt, or catch, working on the wards) also draw the two casements of the sash snugly together, and hold them perfectly steady and firm; and so that the button, bolt, or catch will be so supported and sustained by the several parts of the case and screw, (or rivet,) that it will not be liable to be strained out of its proper position, or injured by any less force than would be required to cut the button, bolt, or catch, square off in the case which sustains it; and so that the button, bolt, or catch will be moved to, and sustained firmly in, its proper position at all times, both when fastened and when unfastened, by a single spiral spring made with one or more turns or coils, so constructed, fitted, and arranged, as to work freely and effectively both ways: that is, to fasten and unfasten; the whole constructed, arranged, combined, and operating, for the purposes substantially as set forth."

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34. For an *Improvement in the Metallic Grummet;* E. H. Penfield, Middletown, Middlesex county, Connecticut, September 19.

The patentee says,—"The nature of my invention consists in making a grummet with an inside and an outside lock; this I do by making it of two ferules having a rim turned upon one edge about half an inch broad; one of said ferules is made with teeth just large enough to slip over the inside ferule, which is left smooth on its edges as a common cylindrical socket.

After cutting a hole in the sail just large enough to receive the grummet, the outside one, or one having teeth, is put though the hole, the inside one, or one with a smooth edge, is then put through, and a conical pin is then drove though, which turns the teeth of the outside one into the cloth, and the edge of the inside one firmly on to the rim of the outside one, thereby firmly fixing it."

Claim.—"What I claim as my invention, is making a grummet of a metallic cylindrical tube or ferule, having a solid disk or rim on one edge, and a similar shaped solid disk with a ferule made with teeth or points, which two together pass through the cloth, and lock in such a manner that the teeth or points may turn over and press upon the cloth, to prevent its being strained and torn, or injured by the strain on the sail, the whole constructed and arranged as set forth."

35. For an *Improvement in Preparing Shoe Pegs;* Charles Gifford, Braintree, Norfolk county, Massachusetts, September 19.

The patentee says,—"The nature of my improvement consists in saturating common wooden shoemakers' pegs with a certain solution or composition, by which the pegs are hardened, prevented from swelling or shrinking, and consequently repel water better, and cling to the leather better, than any other peg."

Claim.—"What I claim as my invention, is the discovery of the composition and its application to, and use for, shoemakers' pegs, so as to make them hard, strong, and water proof."

36. For an *Improvement in Posts for Telegraphs, &c.;* Henry G. Hall, Kirkersville, Licking county, Ohio, September 19.

The patentee says,—"The nature of this invention consists in preventing the posts supporting magnetic telegraph wires from rotting at the surface of the ground, by forming on their lower ends shanks or tenons, and inserting the same into sockets, formed in cast iron shoes, made flaring and sharp on their upper or concave ends, to allow them to be driven into shoulders on the posts which are of greater diameter than the shoes, in order to overhang and protect them, and prevent the water getting into the shoes at the joints, said sockets or concavities being made of greater depth than the length of the tenons, in order to leave spaces between their bottoms and the ends of the tenons after the shoes are driven on the same, and thus allow them to be driven farther on when required."

Claim.—"What I claim as my invention, is the manner of combining the cast iron, or artificial stone, shoes with the posts, by casting the shoes with sockets, of a depth greater than the length of the tenons, on the lower ends of the posts, to be inserted into said sockets, and with fillets or bands around the external surfaces to strengthen the concave ends, which are also made flaring and sharp, so as to be forced into the shoulders o the posts, which are to be of greater diameter than the shoes, in order tof overhang and protect them, and to prevent the water getting into the shoes at the points."

37. For an *Improvement in the Portable Forge;* Christian V. Queen, Peekskill, West Chester county, New York, September 19.

Claim.—"What I claim as my invention, is the employment of a trough or spout to carry off any water that may fall on the hearth, the same being combined with the forge in the manner set forth."

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38. For an *Improvement in Abdominal Supporters;* John W. Phelps, Boston, Suffolk county, Massachusetts, September 19.

Claim.—"What I claim as my invention, is the combination of a back piece, made in two parts and jointed together, as set forth, with the abdominal pad and lateral springs, the whole being constructed and arranged as set forth."

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39. For an *Improvement in Door Springs;* John Maxson, De Ruyter, Madison county, New York, September 19.

Claim.—"What I claim as my invention, is the method of closing doors, &c., by means of a spring attached thereto, and acting on, and in combination with, a cam attached firmly to the door frame, as set forth, whereby the effective force is increased as the tension of the spring decreases, substantially as set forth. I also claim the method of regulating the tension of the spring, by combining therewith the screw-rod that carries the roller that acts on the cam, the sliding tube, and the regulating nut, as set forth."

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40. For an *Improvement in Water Wheels;* Henry Van Dewater, Philadelphia, Pennsylvania, September 19.

Claim.—"What I claim as my invention, is the entire shape, construction, and operation of the gate, with the method of moving it and regulating the supply of water by the lever."

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41. For an *Improvement in the Method of Attaching Tillers;* John G. Hull, City of New York, September 19.

The patentee says,—"The nature of my invention consists in providing an attachment of a tiller to a rudder without morticing or weakening the rudder head, and to give a long purchase on the tiller, whereby both are strengthened, and to support the tiller with connecting bars from a truss band secured on the rudder, from which the bars pass forward on each side, taking their action distant from the rudder, and in order to prevent the impulse of a sea from breaking the castings, they take their pressure against fixed springs on the tiller."

Claim.—"What I claim as my invention, is the mode of attaching the tiller to a solid rudder head, by hooping the same with a truss band, to which my tiller is applied and supported by two connecting bars, which take their effect on the tiller by their connexion with the sockets and springs, ways and straps on each side, as set forth.

"2d, I claim the double action compress springs on the tiller, to prevent any sudden impulse of the sea from breaking the castings or any part of my apparatus or tiller, or any part of the steering gear to which it is applied."

42. For an *Improvement in Locomotives;* Gustavus A. Nicolls, Reading, Berks county, Pennsylvania, September 19.

Claim.—"What I claim as my invention, is, 1st, the employment of a boiler, constructed in the manner and for the purposes set forth, when combined with an engine on a separate carriage, as set forth.

"2d, The employment of a cylinder to constitute the body of the engine carriage, connected and combined with the steam cylinder, as set forth, into which the steam cylinders exhaust, to act as a hot well and partial condenser, and to give the required weight to the engine, that the traction of the driving wheels and the weight may be regulated and adapted to the load to be drawn, and to the condition of the road.

"3d, I claim the air condenser, in combination with the steam cylinders and water cylinder, for the purpose of condensing the exhaust steam, substantially as set forth, the condenser being cooled by the action of the atmosphere.

"And finally, I claim placing the closed ash pan of the boiler furnace on the boiler carriage, in combination with the fan blower placed on the engine carriage, the two being connected by means of an elastic or other yielding pipe, substantially as set forth."

43. For an *Improvement in Washing Machines;* John Young, West Galway, Fulton county, New York, September 19.

The patentee says,—"The nature of my invention consists in constructing a flexible fluted washboard, by making it of segments and suspending the segments upon a cord, strap, or other flexible support, and in combining with the washboard a pair of rotary conical rubbers or rollers and squeezers, mounted upon a car or alternating box, which moves the clothes on the surface of the fluted board."

Claim.—"What I claim as my invention, is the combination of the conical rollers with the hinged platform, for the purpose of rubbing the clothes and squeezing the water out of them at the same time, as set forth."

44. For an *Improvement in Fountain Pen Holders and Nibs;* A. S. Lyman and M. W. Baldwin, Philadelphia, Pennsylvania, September 19.

Claim.—"What we claim as our invention, is, 1st, the method of supplying ink to pens from a reservoir in the handle, by means of a bag or chamber, the whole or part of which is made of gum elastic or other yielding substance, substantially as set forth, whereby the writer can, by the pressure of the finger or thumb, supply the nib with ink while writing, and thus avoid the necessity of dipping the pen. We claim the method, substantially as set forth, of preventing the escape of ink from the fountain, by combining the spring plug, attached to the cap, as set forth. And finally, we claim making pens by coating or plating quill nibs with metal, substantially as set forth."

45. For an *Improvement in Harness Buckles;* Reuben A. Holmes, City of New York, September 19.

Claim.—"What I claim as my invention, is the combination of the metallic case with the cross bars and buckle tongue, substantially as set forth."

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46. For an *Improved Method of Affixing Mortise Locks to Doors;* Rodolphus Kinsley, Springfield, Massachusetts, September 19.

The patentee says,—"The nature of my invention consists in so constructing a lock, as that it can be put into a door without mortising with a chisel, simply by boring, and in fastening said lock and escutcheons in place without the use of screws."

Claim.—"What I claim as my invention, is the face plate, so formed as to be fitted by boring alone, without the use of a chisel. I claim, also, constructing the escutcheon in the manner set forth, with a projecting flanch on the inside, on which are spurs, by which the escutcheon is fastened to the door without screws, substantially in the manner set forth."

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47. For an *Improvement in Stave Machines;* Hervey Law, Wilmington, Hanover county, North Carolina, September 19.

Claim.—"What I claim as my invention, in combination with the cutter, rest, or follower, or any well known mechanical equivalent thereof, is the separate supporting levers, acted on by weights, one lever acting on each edge of the stave, to produce separate and independent pressures near the two edges, holding it firmly against a single fixed piece or rest immediately opposite to the cutters, but permitting all other parts of the stave, however crooked, twisted, or variable in thickness, to pass free from constraint, and at full liberty to take whatever movements, lateral and vertical, its crooks and windings may require, whereby the dressing is allowed to follow the bendings and windings of the stave, without cutting across the grain of the timber; and, in combination with the parts above claimed, I also claim the segmental holdfasts, acting to draw the stave from between the cutter wheel and roller, and thereby prevent the irregular thinning away of its extremities."

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48. For an *Improvement in Screw Threading Machines;* Henry L. Pierson, assignee of John Crum, City of New York, September 19.

Claim.—"What I claim as my invention, is the carrying wheel on the reciprocating carriage, operated substantially as set forth, in combination with the dies in the jaws of the mandril, as set forth, whereby the stem of the screw is moved in and out, for the chasing or cutting of the thread of the screw, by a series of operations, as set forth. I also claim the method of holding the blanks in the rim of the carrying wheel, by combining with the rim of the wheel the pressure roller, substantially as set forth. And finally, I claim the method of increasing the depth of the cut of the chasers or dies in the jaws of the mandril, for each cut in the series, by the threading cam and the wedge-formed slide, operated substantially as set forth, in combination with the carrying and holding wheel, as set forth."

49. For an *Improvement in Refrigerators;* Nathaniel Waterman, Boston, Massachusetts, September 19.

The patentee says,—"The nature of my improvement consists, 1st, In ventilating the refrigerator through its top or lid. 2d, In making the top a close hollow box or chamber, to be filled with atmospheric air only, instead of having two lids, viz. an inner and an outer one, as refrigerators are usually constructed. 3d, In employing uncirculating or confined air, as the non-conducting agent or medium between the inner and outer cases of the refrigerator, instead of charcoal or other stuffing, such as has been commonly used. 4th, In a peculiar valve or contrivance for letting off the waste water and fluid matters which may be discharged from the ice or any meats or articles placed within the refrigerator."

Claim.—"What I claim as my invention, is, 1st, the arrangement of the ventilating apparatus or register, in the lid or at the top of the chamber, as set forth.

"2d, The peculiar capillary valve cesspool, as constructed with the circular shallow groove in the seat plate, and its counterpart on the flap, and made to operate in the manner and for the purposes set forth."

50. For an *Improvement in Loom Pickers;* Josiah M. Colburn, Derby, New Haven county, Connecticut, September 26.

The patentee says,—"The nature of my invention consists in applying or inserting a portion of caoutchouc, or india rubber, to that point of the shuttle picker which meets the point of the shuttle when in use in the loom."

Claim.—"What I claim as my invention, is the addition, application, or insertion of india rubber to that part of weavers' shuttle pickers when the point of the shuttle strikes the picker."

51. For an *Improvement in Saddle Trees for Carts;* Thomas Glasco, Wilmington, New Castle county, Delaware, September 26.

Claim.—"What I claim as my invention, is the friction rollers, constructed so as to slide on their axes, in the manner and for the purposes set forth."

52. For an *Improvement in Jaw Temples for Looms;* Benjamin Peck, Rehoboth, Bristol county, Massachusetts, September 26.

Claim.—"What I claim as my invention, is the particular combination and arrangement of parts, whereby the jaws and wedge are operated by the lay being made to beat up against one arm of a lever only, and the jaws, while being operated by the wedge, are held in position by a notch of the other arm of the said lever."

53. For an *Improvement in the Upper Floors of Ice Houses;* Peter Kephart, Baltimore, Maryland, September 26.

Claim.—"What I claim as my invention, is the so constructing of said apparatus, as that the ice shall be so protected by the sinking sectional non-conducting floor as to arrest, in a great measure, the large amount of waste produced by the warmth of spring and summer, the said arrangement also preserving a dry pleasant atmosphere in the house, and at the same time affording easy access when ice may be required, the respective parts being arranged and operating substantially as set forth."

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54. For an *Improvement in Dressing Staves;* Hosea Benson, Jackson, Susquehanna county, Pennsylvania, September 26.

The patentee says,—"The nature of my invention consists in a novel arrangement and combination of drivers and arms, connected together by joint pins, to which is imparted a horizontal revolving small cam wheel, by which the stave is forced between vertical shaves or cutters of the usual concave and convex forms, and by which the stave is dressed on its sides to the required form and thickness; and also the combination of certain other parts, by which the stave, after being dressed on its flat sides, is listed on its edges to its required taper, from the centre to the ends, to form the bilge, and at the same time bevelled on the edges to correspond with the curvature; the back or return movement of the drivers being effected by the gravity of weights attached to cords fastened to jointed arms attached to the drivers, and running over channelled pulleys."

Claim.—"What I claim as my invention, is, 1st, the combination of the driver, adjustive roller, and loose cutters or shaves, for shaving crooked or winding staves, as set forth.

"2d, I claim the employment of the vibrating patterns, in combination with the inclined blocks upon which they are placed, and the double edged cutters for listing bilge staves, as set forth."

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55. For an *Improvement in Cultivators;* George Gross, Jr., Germantown, Montgomery county, Ohio, September 26.

Claim.—"What I claim as my invention, is the so combining and arranging of the wings of my cultivator with the supporting frame, that their posterior extremities can be brought nearer to, or separated farther from, each other, and the rows of corn, &c., to be cultivated thereby without varying the angle of inclination of the wings with each other, substantially as set forth."

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56. For an *Improvement in Machinery for Breaking and Cleaning Hemp;* Lewis W. Colver, Glasgow, Howard county, Missouri, September 26.

Claim.—"What I claim as my invention, is, 1st, the peculiar construction of the curved or hooked knives on the ends of the alternate vibrating breaker beams, for the purpose of taking the hemp in between the edges of said cleaner knives with facility, said knives acting successively on the hemp in the manner set forth.

"2d, I also claim balancing the three beams on an axle, in combination, and causing them to operate successively by a three-throw crank, or other equivalent means, whereby much power is saved, injury to the hemp is avoided, and the resistance of the machine is at all points nearly the same, the whole being constructed and operating substantially as set forth."

57. For an *Improvement in Washing Machines;* Charles Leonard, Indianapolis, Marion county, Indiana, September 26.

The patentee says,—"The nature of my invention consists in mounting, in a rectangular or other formed wash box or tub, three revolving cylindrical brushes and a revolving rest, between which brushes the clothes are caused to pass, and by the action of which, combined with the cleansing effect of the soap and water, the dirtiest clothes are quickly cleaned."

Claim.—"What I claim as my invention, is the combination and arrangement of the revolving brushes with the revolving and vibrating brush, in the manner and for the purposes set forth."

58. For an *Improvement in Machinery for Turning the Heads of Wood Screws;* J. L. Pierson, assignee of John Crum, City of New York, September 26.

Claim.—"What I claim as my invention, is paring off or turning the heads of the blanks within the rim of the carrying or holding wheel, which has a reciprocating motion from and towards the mandril, by combining therewith a cutter or cutters that move towards the blank by a motion at right angles to the axis of the blank, substantially as set forth."

59. For an *Improvement in Bridles;* Henry Seitz, Marietta, Lancaster county, Pennsylvania, September 26.

Claim.—"What I claim as my invention, is, 1st, the employment of the stops attached to the reins, in combination with the cylinders containing the pulleys and axles, arranged and operated in the manner and for the purpose set forth.

"2d, I also claim the employment of the perforated flanched cylinders and wheels, in combination with the bit, in the manner and for the purpose set forth."

60. For an *Improvement in the Method of Raising Water;* Elijah H. Holt, Fowler's Mills, Geauga county, Ohio, September 26.

The patentee says,—"The nature of my invention consists in the combination of a peculiar bucket, so constructed as to fill with water when let down into the well, and emptying itself when raised to the desired height."

Claim.—"What I claim as my invention, is the combination of the shaft, arm, pins, lever, weight, and rod, arranged substantially as set forth, with a valve-bottomed bucket, for the purpose of discharging the same."

61. For an *Improvement in Lanterns;* Henry Evans, Jr., Newark, Essex county, New Jersey, September 26.

The patentee says,—"The nature of my invention consists in the formation and mode of combination of the several parts which constitute the lantern, in such a manner as to save much of the ordinary expense of labor in the construction thereof, and constitute a lantern of extraordinary excellence for common use."

Claim.—"What I claim as my invention, is the within described peculiar mode of constructing the sides or peripheries of lanterns, which consists in soldering to each other, vertically, several tin plates, the edges of which are bent inwards, so as to form grooves to receive the edges of plates of wires or glass, as set forth."

62. For an *Improvement in Brakes for Cars;* John Ellenwood, Hillsborough, Hillsborough county, New Hampshire, September 26.

Claim.—"What I claim as my invention, is the manner in which I adapt the wedges to both of the wheels against which they act, or, in other words, I claim the combination of the wedge carriage, (composed of the levers and sustaining wheels, other parts substantially as set forth,) with the car and its wheels, and the friction wedges or their equivalents, the whole being constructed and made to operate substantially as set forth."

63. For an *Improvement in Lime Kilns;* Eleazer Orcutt, Bennington, Bennington county, Vermont, September 26.

Claim.—"What I claim as my invention, is constructing the top of the kiln, with the cupola above the arch, as set forth, said arch and cupola being made with the draught holes, for the purpose of regulating the heat of the kiln, the regulating of the heat being produced by opening and closing the said holes, and the confining and saving of the heat being effected by constructing the arch over the kiln, and the cupola over the arch, as described."

64. For an *Improvement in Boring Machines;* Joseph Jones, Camden, Camden county, New Jersey, September 26.

Claim.—"What I claim as my invention, is, 1st, the combination of the graduated sliding legs with the carriage, for the purpose of supporting the several rests in various positions, as set forth.

"2d, The combination of the adjustive platform and carriage with the compound adjustive rest, for the purpose of holding any substance to be bored, and advancing the same upon the augur, in such position that holes will be made in it in any required direction.

"3d, The combination of the compound adjustive clamp with the adjustive rest, as set forth, for the purpose of clamping and holding firmly any substance which it may be required to bore, whether the same be of regular or irregular form."

65. For an *Improvement in Saw Sets;* Abel Stillman, Poland, Herkimer county, New York, September 26.

Claim.—"What I claim as my invention, is the revolving jaw, having at the ends of its arms depressions of different lengths and depths, and lengths for different teeth, in combination with the angle bar and adjusting screw, substantially as set forth."

66. For an *Improvement in Hemp Brakes;* Harvey Guild, Cincinnati, Hamilton county, Ohio, September 26.

Claim.—"What I claim as my invention, is the application to the purpose or operation of breaking hemp or like fibres in a power brake, of revolving beaters, after the manner or principle set forth, in combination with the vibrating prongs applied to my power brake."

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67. For an *Improvement in Cutting the Screws on Rails of Bedsteads;* Spencer Lewis, Tiffin, Seneca county, Ohio, September 26.

Claim.—"What I claim as my invention, is the combination and arrangement set forth, of the half or sectional cutter, secured on the end of the inner surface of the tubular holder, with the entire cutter, also secured to the inner surface of the holder, for the purpose of cutting a sectional thread adjacent to the shoulder of the tenon on the end of the rail, corresponding to the sectional thread cut on the outer end of the female screw in the post, so that the rail, having a square shoulder, and the thread of the screw cut on the entire length of the tenon, may be screwed up tight against the face of the post, forming a close and perfect joint, which cannot be effected by any other machine in use or known."

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68. For an *Improvement in Platform Scales;* Stephen F. Stevens, assignee of John Underwood, Montpelier, Washington county, Vermont, September 26.

Claim.—"What I claim as my invention, is the manner in which I arrange and combine the levers for supporting the platform: that is to say, I claim connecting the short arms of these levers, by extended connecting bars, with similar short arms at the other end of the platform, said short arms sustaining the platform in the manner set forth, whereby my scale presents fewer points of bearing and connecting parts than others in use. I also claim as my invention, the use of the screw for a scale beam, and the mode of registering the divisions of weight on the graduated plate fixed to the beam, and on the circumference of the cylindrical poise."

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69. For an *Improvement in Self-Loading and Self-Capping Repeating Fire Arms;* Milo M. Cass, Utica, Oneida county, New York, September 26.

Claim.—"What I claim as my invention, is, 1st, the employment of an endless chain of cartridge boxes, open at both ends, for conveying the cartridges in succession to the chamber of the fire arm, in combination with the table for preventing the descent of the cartridges, the guide of the ramrod through the same in driving the cartridge from the conveyor into the chamber.

"2d, I also claim the employment of the jointed lever, in combination with the endless chain of cartridge boxes, for revolving the same, propelling the ramrod or piston, and closing the segment stopper into the hollow breech pin, as set forth.

"3d, I claim the use of a revolving disk of nipples, containing the percussion caps, in combination with the lock for producing successive discharges, as set forth, irrespective of the endless chain of cartridge boxes and jointed levers, and other parts of the fire arm."

70. For an *Improvement in Railroad Cars;* John F. Rodgers, Troy, Rensselaer county, New York, September 26.

Claim.—"What I claim as my invention, is supporting the truck on journals made each side of the wheels, on the hubs or short axles, when this is combined with the long axle passing through the hubs or short axles, substantially as set forth."

71. For an *Improvement in Grain Dryers;* Hiram H. Scoville, Chicago, Cook county, Illinois, September 26.

Claim.—"What I claim as new, is the particular manner in which I have combined and arranged the respective parts thereof: that is to say, I claim, in combination, the spaces and the scrapers passing through the former, by the action of endless chains or bands, the said spaces being connected with the flues, and the whole operating substantially in the manner and for the purposes set forth."

List of American Patents which issued in the month of October, 1848, *with Exemplifications, by* Charles M. Keller, *late Chief Examiner of Patents in the U. S. Patent Office.*

1. For an *Improvement in Machinery for Cleaning Tobacco Leaves;* James E. Allen, Oxford, Granville county, North Carolina, October 3.

Claim.—"What I claim as my invention, is the mode of spreading and brushing tobacco by rotary brushes, in the manner set forth."

2. For an *Improvement in Machinery for Planishing and Hammering Metal;* Cornelius D. Goodrich, Ann Arbor, Washtenaw county, Michigan, October 3.

The patentee says,—"The nature of my invention consists in a machine furnished with a balance wheel, to which is attached a groove circle near the centre, into which are inserted any number of anti-friction rollers desirable; a lever with the segment of a circle or cam made on, or attached to, the end, which lever is attached or connected to a hammer; this lever is fastened or plays in a movable or sliding box inserted into the fulcrum of the lever; a spring connected with the hammer; a hammer and anvil."

Claim.—"What I claim as my invention, is the combination of the balance wheel, groove circle, anti-friction rollers, segment or cam, lever, sliding or graduating box, and spring, combined and arranged so as to produce a blow by the hammer.

3. For an *Improvement in Printing Presses;* Joseph M. Marsh, City of New York, October 3.

Claim.—"What I claim as my invention, is the method of obtaining a reciprocating motion from a continuous rotary motion, by combining with a cogged rack two cogged wheels, composed each of segments of different diameters, the small segment of one wheel engaging the cogs of the large segment of the other, and *vice versa*, as set forth. I claim, in combination with the combined segmental cog wheels, made and running together as set forth, making the cogs of the rack of gradually less depth towards the ends, and towards the middle of its length, and with a long cog at each end, substantially as set forth. I also claim the method of sustaining the bed of the press as it reciprocates against the pressure of the cylinder, by combining with the bed one or more ways and rolling segmental bearers, substantially as set forth. I also claim the method, substantially as set forth, of elevating and depressing the inking rollers, as the bed of the press runs in and out, by combining with the rollers the sliding boxes and the trip levers, operated by the reciprocating carriage, as set forth. And finally, I claim operating the finger bar by means of spring-jointed arms at the end thereof, substantially as set forth, to admit of turning back the cylinder without injury to the arms, finger bar, or fingers, as set forth."

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4. For an *Improvement in Manufacturing Sheet Lead;* John Robertson, Brooklyn, Kings county, New York, October 3.

Claim.—"What I claim as my invention, is the mode of manufacturing such hollow cylindrical forms of lead, and other soft metals and compounds, into sheets, by first placing them round a roller whose axis may be in a horizontal plane, or in one of any inclination, and then rolling it by any known mechanical means, until it shall be rolled to a proper thickness, substantially as set forth, whereby handling the sheet during the process is avoided, and a continuous rotary motion in one direction may be given to the rolls. I claim the construction of the carrying roller, constructed substantially as set forth, and the manufacture therewith of hollow cylindrical formed pieces of lead, or other soft metal or compound, into sheets by rolling, combined with the movable bearings and pressing roller or rollers, substantially as set forth. I claim the manufacture of lead, or other soft metal or compound, into sheets, by supporting a hollow form thereof, and rolling it by one or more pressing rollers, forced against the outside of the form as it becomes thinner, and drawing out the extended form when required, in the mode set forth."

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5. For an *Improvement in Ice Cream Freezers;* E. C. Seaman, Philadelphia, Pennsylvania, October 3.

Claim.—"What I claim as my invention, is the side scrapers, the bottom scraper, and, in combination therewith, the dashers, the whole being constructed and operating substantially in the manner set forth."

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6. For an *Improvement in Harness Saddles;* A. D. Brown, City of New York, October 3.

Claim.—"What I claim as my invention, is, 1st, the peculiar form of the sheet metal housing plate, caused by the addition of the lower flanches, (or ledges,) constructed substantially in the manner set forth.

"2d, I also claim the securing the pieces of leather forming the under side of the pads, with the housing plate forming the upper side of the same, by means of the fastening plates, with notched (or plain) edges, arranged and combined with the flanches, substantially in the manner set forth.

"3d, I also claim the combination of the housing plate and pads, combined in the manner set forth, with the stiffening arch piece, the straps, and the housing leather, substantially in the manner set forth."

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7. For an *Improvement in Bell Telegraphs;* E. J. Mallett, City of New York, October 3.

Claim.—"What I claim as my invention, is the arrangement and combination of levers, operated by wires, with the hammers and sliding plates, by means of angular or curved faces, substantially as set forth, whereby I am enabled to substitute gravity for the tension of springs, in apparatus for ringing bells and indicating what is wanted or required to be done, as set forth."

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8. For an *Improvement in Grinding Mills;* Edwin Butterfield, assignee of G. W. Clark, Lowell, Middlesex county, Massachusetts, October 3.

Claim.—"What I claim as my invention, is the combination of the two concentric grinding surfaces, within and without the partition, the said partition, passage, and inlet and exit passages, made upon or in the plate, and made to operate in connexion with the plate, all substantially as specified; and whether the grain is received at or near the centre of the plate and discharged at its circumference, or *vice versa*, as set forth."

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9. For an *Improvement in Scales for Weighing;* E. Sampson and E. S. Collier, Weathersfield, Windsor county, Vermont, October 3.

Claim.—"What we claim as our invention, is the combination of the wings with the weighted levers, arranged and operating in the manner and for the purposes set forth."

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10. For an *Improvement in Grist Mills;* Lewis Norton, Madison, New Haven county, Connecticut, October 3.

The patentee says,—"The nature of my invention consists in running grist mill stones without the intervention of gearing from the main shaft."

Claim.—"What I claim as my invention, is the mode of coupling shafts in grist mills, which admits the stones to be set close or apart without the use of gear wheel, constructed and operating substantially as set forth."

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11. For an *Improvement in Table Cutlery;* Marvin Smith, Meriden, New Haven county, Connecticut, October 3.

The patentee says,—"My improvement consists in placing the bolster, that serves as a fulcrum across which the handle is made to balance the blade of the knife or fork, from one half of an inch to two inches from the end of the handle connected with the shoulder, and in place of so much of the blade, I make a shaft or shank, with the bolster or fulcrum between the shank and the blade."

Claim.—"What I claim as my invention, is making table knives and forks with the bolster between the blade of the knife, (or prongs of the fork,) and the shaft, as set forth; also placing the bolster or fulcrum, across which the weight of the handle causes the blade of the knife (or prongs of the fork) to be elevated above the table, nearer to the point of the knife or fork, and farther from the handle, thereby saving the loading of the handle and other consequent injury."

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12. For an *Improvement in Machines for Hoisting;* J. W. Wilson, Syracuse, Onondaga county, New York, October 3.

The patentee says,—"The nature of my improvement consists in the method of changing the power of a fall, for hoisting heavy bodies on warehouses and other similar places, from a single wheel and axle to a double gear, by which any amount of power can be obtained in a much less space than has heretofore been done, while the facility of operation is greatly increased, and the shifting readily done on any story where the person hoisting stands."

Claim.—"What I claim as my invention, is the combination of the clutch and gear, substantially as set forth, so that the fly wheel and drum shall never be out of connexion, for the purpose set forth."

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13. For an *Improvement in Grinding Mills;* Zachariah Griffin, Montgomery, Montgomery county, Alabama, October 3.

Claim,—" What I claim as my invention, is the combination of the spring, screw, bolt, and set screws, with the bed stone, substantially as herein set forth, for the purpose of adjusting the same in a firm but not rigid manner whereby its breaking from the pressure of the set screws necessary to its adjustment is prevented.

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14. For an *Improvement in Saddle Frames;* Levi Hall, Adrian, Lenawee county, Michigan, October 3.

The patentee says,—"The nature of my invention consists in constructing saddles in such a manner that I am enabled to dispense with the use of saddle trees of ordinary construction, and also in forming the seat and skirts of the saddle of only two pieces of leather united by a seam running lengthwise through the centre of the seat."

Claim,—"What I claim as my invention, is first, the forming a saddle by the combination of the pads, the metallic arch piece, the cantle and covering, substantially in the manner set forth, by which I am enabled to dispense with the ordinary saddle tree and other parts. 2nd. I also claim the staying and giving the proper stiffness to the pads by means of the side boards, placed within the same, substantially at set forth. 3rd. I also claim the construction of the cantle separate from the frame, and combining it with the covering of the seat, and with the pads, substantially as set forth."

15. For an *Improvement in Grinding Mills;* William B. North, Jersey City, Hudson county, New Jersey, October 3.

The patentee says,—"The grinding part of my mill consists of a sphere and of a hemisphere of iron, steel, or other suitable metal, or material.—The spherical part is fixed to, and made to revolve with a shaft placed horizontally, and the hemispherical portion on a shaft that revolves vertically; this hemispherical portion is concave, and embraces the upper portion of the revolving sphere."

Claim.—"What I claim as my invention, is the combining of a spherical body revolving on a horizontal axis, with a hemispherical cup embracing the upper portion of said sphere, and made to revolve on a vertical axis under an arrangement of parts, and for the purposes set forth."

16. For an *Improvement in Steering Vessels;* Edward Rouse, Augusta, Kennebeck county, Maine, October 3.

Claim.—"What I claim as my invention, is the combination of a compensating barrel, with two sets of toggle joint levers, arranged substantially as set forth, and the whole being made to operate with the tiller, for the purpose set forth, not intending by this claim to limit myself to the precise form of the respective parts, but to vary them as I may find expedient."

17. For an *Improvement in Horse Rakes;* R. B. and A. C. Jennings, Livermore, Oxford county, Maine, October 3.

Claim.—"What we claim as our invention, is the combination of the reacting spring guard, with the tooth bars, substantially in the manner and for the purposes set forth."

18. For an *Improvement in Corn Planters;* Jacob Yoder, John Guilleford, and Elias Gruver, Juniata county, Pennsylvania, October 3.

Claim.—"What we claim as our invention, is 1st, the application and use of a skeleton or sifting plough, operating for the purposes set forth.—2nd. The application and use of a spring guard or coulter for protecting the point of the plough from injury, from stones and other obstructions in the manner set forth."

19. For an *Improvement in Spark Arresters;* Augustus Hamann, Washington city, District of Columbia, October 10.

The patentee says,—"The nature of my invention consists in covering the top of the boiler with a metallic chamber, the bottom of which fits the top of the boiler and extends down the sides thereof, which is so connected with the flue stack as to turn all the products of combustion into it, and cause them to circulate through it, and then deposit the sparks before the smoke escapes through the stack."

Claim.—"What I claim as my invention, is the spark arrester constructed substantially as set forth, covering the top of the boiler and forming a chamber in which the sparks are deposited in horizontal passages or return flues, which serve for a jacket to the boiler, in the manner and for the purposes set forth."

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20. For an *Improvement in Grinding Mills;* F. M. Hemphill and R. H. Knox, Washington, Fayette county, Ohio, October 10.

The patentees say,—"The nature of our improvement consists in the manner of attaching the spindle to the water wheel shaft, the driver and balance rind formed in one piece, the stationary centre or eye in the runner, and in the manner of bushing the spindle."

Claim.—"What we claim as our invention, is, first, the method of connecting the spindle with the shaft of the water wheel, as set forth, the whole being raised and lowered together, and the spindle having liberty to turn without the wheel, as set forth. Secondly, we claim the stationary centre or eye to the runner, in combination therewith the flaring of the runner below, to prevent the grain clogging in the eye of the stone."

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21. For an *Improvement in Screw Blank Machines;* R. F. Berwick, City of New York, October 10.

Claim.—"I claim the cam for the particular purpose for which it is used in closing the dies, and the manner in which it allows the dies to become loose by the shallow groove upon a part of its surface, and also for the purpose of moving the bolt which contains the dies, thus the cam performs two distinct services. I claim as new the movable caps upon the surface of the wheels, which caps are for regulating the length of wire to be rolled in the dies, as set forth. I also claim the plates which regulate the length of the wire to be cut off. I claim the combination of the different parts of my machine, in the manner set forth."

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22. For an *Improvement in Harness Buckles;* Oscar S. Burges, Columbus, Franklin county, Ohio, October 10.

The patentee says,—"The nature of my invention consists in the application of the combined principles of the slide, wedge, and lever, in connexion with most of ordinary buckle frames; the wedge piece having attached to it a loop of metal through which the end of the strap to be fastened passes, and binds so as to draw the fastening into action, forming thereby a buckle, adapted to all uses required; varying the size and form to suit the purpose for which any buckle is required."

Claim.—"What I claim as my invention, is the slide, wedge, and lever, in connexion with the buckle frame, and its adaptation to most of the known forms of buckle, as set forth, or any mechanical equivalent therefor, substantially the same in principle, in such manner as when in use to bring into operation the principles of the combined slide, wedge, and lever. I also claim the employment of the loop for connecting the wedge, or its equivalent, with that portion of the strap which is to be fastened, so that by drawing upon the strap the fastening will be drawn into action."

23. For an *Improvement in Chimney Caps;* John P. Hayes, Boston, Suffolk county, Massachusetts, October 10.

Claim.—"What I claim as my invention, is, in a ventilator such as I have described, arranging a conical deflecting surface on the *top* of the disk, and also another deflecting surface, having the shape of a frustrum of a cone on the underside of the surface, the arrangement and purpose of the same being substantially as set forth. I also claim the arrangement of a turning cowl constructed as set forth, between the disk and the surface, in the manner and for the purpose set forth."

24. For an *Improvement in Presses;* David Dick, Meadville, Crawford county, Pennsylvania, October 10.

Claim.—"What I claim as my invention, is the combination of two eccentric sectors having their bearings upon edges as set forth, with a roller placed between them whose axis has free play, all in the manner and for the purpose set forth."

25. For an *Improvement in Moulders' Flasks;* Livingston, Roggins, and Adams, Pittsburgh, Allegheny county, Pennsylvania, October 10.

The patentee says,—"The nature of our invention, consists in giving the sides of the flask an inward inclination from the bottom of its lower portion, commonly called the drag, to the top of its upper portion, commonly called the cape, for the purpose of enabling the moulder to withdraw the flask from the mould formed therein, and using the same flask for forming any number of moulds."

Claim.—"What we claim as new, is the inclining the sides of the upper and lower portions (commonly called the cope and drag) inwards, from bottom to top, in combination with the sliding plates, or their equivalents connected therewith, substantially in the manner and for the purposes set forth."

26. For an *Improvement in Ventilating Ships;* Frederick Emerson, Boston, Suffolk county, Massachusetts, October 10.

The patentee says,—"My improvement consists in placing injecting ventilators and ejecting ventilators in different parts of the craft, for removing the foul air therefrom, and supplying its place with pure air from the atmosphere above."

Claim.—"What I claim as my invention, is the employment of two or more certain ventilators, constructed as set forth in combination with water craft, as set forth, for the purpose of removing all noxious and unpleasant gases therefrom, and introducing in their place pure atmospheric air."

27. For an *Improvement in Manufacturing Spikes;* James H. Swett, Concord, Merrimack county, New Hampshire, October 10.

Claim.—"What I claim as my invention, is, 1st, Holding the piece of iron to form the spike with the point against the dies, fastened in rolls, whilst the head is being turned and shaped at the same time by the header upon the heading plate, as set forth.

"2d, I claim the crooked header, in combination with the arms to which it is attached, and the gearing for giving it the required movements, by which the spike is hook headed by one motion as set forth.

"3d, I claim the combination and arrangement of the arms, joint bolts for adjusting the crooked headed header.

"4th, I claim constructing the upper die with an additional triangular projection, for shaping one side of the end of the piece of iron that is to form the spike, so as to produce the proper slope, preparatory to its being bent down over the heading plate, by the inclined end of the crooked header as set forth."

28. For an *Improvement in Uterine Supporters;* James Betts, assignee of Joseph Schofield, Philadelphia, Pennsylvauia, October 10.

The patentee says,—"The nature of my invention and improvement, consists in constructing of porcelain or other suitable material, an artificial support for a prolapsed uterus, which will maintain it in a natural and easy position, without pain or injury, and without irritating or otherwise doing violence to the adjacent parts."

Claim.—"What I claim as my invention, is the combination of elastic retaining straps of india rubber, with the "supporter," which straps being impervious to moisture, may be washed to keep them clean, wholesome, and free from odor, without detaching them from the body."

29. For an *Improvement in the Shot Plug;* Samuel J. Seeley, City of New York, October 10.

Claim.—"What I claim as my invention, is the plug as set forth for stopping leaks in vessels, caused by the shots of the enemy during an engagement, or by a snag, or from any cause whatever, whether the plug be made precisely in the manner set forth, or in any other mode or manner which shall be substantially the same."

30. For an *Improvement in Type Moulds;* H. W. Day, Boston, Suffolk county, Massachusetts, October 10.

Claim.—"What I claim as my invention, is the described combination of stationary and movable plates, constituting the body and sprue matrixes as arranged and made to operate together with adjusting contrivances, substantially in manner and for the objects as set forth, and in combination with the matrix of the body of the type. I claim the movable gauge plates, and stop plate, as arranged and made to operate substantially as set forth."

31. For an *Improvement in Wheels for Spinning;* Jacob Shaw, Jr., Hinckley, Medina county, Ohio, October 10.

Claim.—"What I claim as my invention, is the construction and the combination of the vibrating frame, with the accelerating wheel and bench by means of two hollow rods, constituting an axis for the vibrating frame, and boxes or bearings for the axle of the accelerating wheel, in such a manner that the motion of the vibrating frame, and the motion of the accelerating wheel will be concentric, and the main and accelerating band retain the same degree of tension, in whatever position the vibrating frame may be placed, or whether in motion or at rest. The combination of the treddle, with the vibrating frame and the bench, and the combination of the parts, composing the axis of the vibrating frame with the frame. And I claim each part and combination before claimed, which has not been before known and used, whether the same is used separately or in combination with other parts claimed, or with parts of spinning wheels which have been before known and used, or with parts which are not now known, but may be hereafter known and used."

32. For an *Improvement in Corn Shellers;* Charles Sines, Village Green, Delaware county, Pennsylvania, October 10.

Claim.—"What I claim as my invention, is the combination of the vibrating hinged clamp boards, with the revolving shelling wheel for separating the cobs from the corn during the operation of shelling—said clamp boards being constructed with segmental conductors, and inclined aprons arranged and operated in the manner set forth."

33. For an *Improvement in Blocking Hats;* William Wright, Philadelphia, Pennsylvania, October 10.

The patentee says,—"The nature of my invention consists with what is known among hatters, and hat-block makers, by the name of a hat-screw or set, an elastic band or hoop of a circular or oval form, which hoop or band encircles the hat screw or set, and is fastened to the two ends so as to construct an entire machine, by which the shape of hats may be more easily and perfectly changed, than by the use of the ordinary hat-screw."

Claim.—"What I claim as my invention, is the making and use for the purposes set forth, of the hoop or band of elastic material, whatever its dimensions or precise form, and its combination with the hat-screw or set, as previously in use, or as it may be otherwise modified, in what manner soever the hoop or band may be attached to it, so as to compose the entire machine set forth, and the application of that machine to the purposes set forth."

34. For an *Improvement in the Apparatus for Breathing Ether;* Lewis Roper, Philadelphia, Pennsylvania, October 10.

Claim.—"What I claim as my invention, is the mouth-piece, or the peculiar formation of the upper part of the instrument or vessel set forth, fitting closely over the mouth and nose, so as to administer the vapor of ether through these two organs simultaneously, and in combination therewith, the arrangement of the air tube and perforated plate."

35. For an *Improvement in Machinery for Doubling and Twisting Yarn;* Thomas Lyle, Collinsville, Blair county, Pennsylvania, October 17.

The patentee says,—"The nature of my invention, consists in a peculiar construction of a flyer for the reception of several bobbins of thread to be doubled, twisted and reeled, arranged one above the other in the same vertical axis, revolved simultaneously, in combination with a revolving reel upon which the thread is wound, after passing from the several bobbins, over guide wires, and through the hollow journal of the spindle, in which the required doubling and twist is imparted to the threads."

Claim.—"What I claim as my invention, is constructing the flyer with several divisions, or spaces, for the reception of as many bobbins as there are threads to be twisted, one arranged over another in the same vertical axis, having grooved division plates, guide wires, and hollow journal, through which the several threads from the bobbins are passed, to be doubled, twisted and reeled, in combination with the reel, upon which the threads or yarns are reeled, as fast as they are doubled and twisted—the whole revolving simultaneously in the manner and for the purpose set forth, whether the several parts be combined and arranged as set forth, or in any other mode which is substantially the same."

36. For an *Improvement in Making Lead Pipe;* Stephen Parks, Jr., Brooklyn, Kings county, New York, October 17.

Claim.—"What I claim as my invention, is the combination, arrangement and operation with each other of the hollow cylinder, the tube, having a screw formed in a portion of its periphery, the shaft, the core, or mandril, and the die, substantially as set forth."

37. For an *Improvement in Cylindrical Wrought Nail Machines;* Charles J. Richards, City of New York, October 17.

The patentee says,—"The nature of my invention consists in making a machine to make nails from rods by means of cylinders, four being used; two of which are composed of a disk, with cams attached to springs, and the centre or disk, while there are two others which are for closing the cams; these cams with the springs connected, I call spring hammers. The two cylinders of spring hammers form the nails on their peripheries, and sides or flanches; these being so shaped as to give shape to the nails. The form of the nail to be produced is formed upon the periphery and flanch of the cylinders; that is, the form of the head is indented into and the points raised up on the surface of these cylinders of spring hammers; so that by passing the rods through between the cylinders (the rods being at a welding heat,) the rod will be converted into nails."

Claim.—"What I claim as my invention, is the spring hammers, combined into a cylinder in manner and for the purposes set forth, viz: making nails, spikes, brads, and such like articles.

38. For an *Improvement in Floating Batteries;* John P. Taylor, Little Compton, Newport county, Rhode Island, October 17.

Claim.—"What I claim as my invention, is the employment of a pointed, floating, explosive battery, of the peculiar shape set forth, having an angular recess at the stern, corresponding with the shape of the bow of the propeller received therein, and charged with explosive materials, in combination with a shot and bomb proof steam propeller, having a semi-eleptical covering, for glancing the balls of the enemy; to which it is attached, for driving it into the vessel to be destroyed, and after igniting the slow matches, leaving the explosive battery to perform its office of destroying whatever object it is driven into, as set forth."

39. For an *Improvement in Ploughs;* W. W. Metcalf, York Springs, Adams county, Pennsylvania, October 17.

The patentee says,—"The nature of my invention consists in combining with any common plough, a lever which turns on a pivot, to clear away the straw, stubble, grass, or other obstruction which may, or usually does accumulate upon the front edge of the coulter, by a simple motion of the hand of the ploughman while the plough is progressing; instead of stopping it, and walking round to remove the obstruction by the hand or foot, which is the only way in which such obstructions can be removed from the common plough."

Claim.—"What I claim as my invention, is the combination of the lever with the plough; for the purpose of clearing obstructions from the coulter, whether the same be constructed, arranged, and operated as set forth, or in any other manner substantially the same.

40. For an *Improvement in Presses;* David Dick, Meadville, Crawford county, Pennsylvania, October 17.

Claim.—"What I claim as my invention, is the combination of the two excentric wheels, with the centre wheel or roller, by which a double traverse of the follower is produced, by revolving the one centre wheel or roller. I also claim the combination of the excentric wheels, with the friction relieving sectors, all combined in the manner and for the purposes set forth.

41. For an *Improvement in Flood Fences;* John A. Swope, Germany, Adams county, Pennsylvania, October 17.

The patentee says,—"The nature of my invention consists in such a construction that the action of the flood upon a lever shall throw loose the ends of the rails from the key posts, and then each released pannel, throw loose the next, and so on successively, until all the pannels are thrown loose; and in so attaching the rails that they may yield to and float with the current, whilst secured to the posts."

Claim.—"What I claim as my invention, is the mode of constructing a flood fence, so that the action of the flood, upon the arm of the lever shall release the rails, and that the opening one pannel, shall throw loose the next pannel, and it the next, and so on successively, until all the rails shall be thrown loose; and they shall float with the current at the same time that they are securely attached to the posts."

42. For an *Improvement in Planting Ploughs;* A. B. Earle, Colesville, Brown county, New York, October 17.

The patentee says,—"The nature of my invention consists in the construction of an instrument which I denominate a planting plough, because it performs the office of ploughing and planting at the same time, and in one machine."

Claim.—"What I claim as my invention, is the combination of the signal bell, or other like indicator with the valves to announce the exact time of depositing the seeds, substantially as set forth."

43. For an *Improvement in Cultivators;* George Beeching, Augusta, Oneida county, New York, October 17.

Claim.—"What I claim as my invention, is, 1st, the construction of quadrangular teeth for cultivators, as set forth.

"2d, I also claim the construction of the U shaped iron brace having a clevis formed on its front, and two vertical transverse grooves on its sides, as combined with the adjustive standards.

"3d, I claim the extra handles for raising the cultivator in turning at the end of the furrow, or going over stones, &c. as set forth."

44. For an *Improvement in Harness Saddle Mounting;* John J. Carrel, Petersburgh, Dinwiddie county, Virginia, October 17.

The patentee says,—"The nature of my invention consists in the method of constructing and attaching the water hooks, turrets, and screws, that are used on harness saddles, in such a manner as to prevent their injuring the horse's back, and at the same time strengthening the parts without, increasing their number or cost materially, the beauty of the mountings thereby being incidentally increased."

Claim.—"What I claim as my invention, is the method of connecting the turrets, water hooks, and screws with the harness saddle, by forming the female screw in the shanks of the turrets and water hook, and passing the male screw up from below into them, by which greater length of screw and strength is attained, and the liability of injuring the horse avoided, there can be also a saving of material in the pad, and of labor in manufacturing."

45. For an *Improvement in Locking Umbrellas and Parasols;* G. F. Southwick, Somerset, Bristol county, Massachusetts, October 17.

Claim.—"What I claim as my invention, is a locking contrivance, as applied to or combined with an umbrella, and made to operate substantially as set forth."

46. For an *Improvement in Domestic Telegraphs;* John Russel, City of New York, October 17.

The patentee says,—"The nature of my invention consists in connecting the wires leading to the several rooms of the hotel or other building, to which the telegraph is applied, to a series of inclined levers combined with sliding bars, spiral springs, weighted levers, and suspended plates, marked with the several numbers of the rooms, with which the wires communicate, confined with a bell hammer and suitable mechanism for operating the same; and enclosed in a suitable case arranged conspicuously in the room of the clerk or servant whose duty it is to attend to the answering of the bell; in such a manner, that when a bell-pull of a room is drawn, the plate containing the number of the room in which the summons is made, will be caused to fall below the part of the case covering the same, and exposed to the view of the servant, and remain down until drawn up by him; and simultaneously with its descent, the hammer will be caused to strike the bell, to call the attention of the attendant to the number down, thus making one bell answer for all the rooms of the hotel or other building in which the apparatus is arranged, and exposing conspicuously to view the number of the room in which the bell-pull is drawn; so that should the attendant be absent at the time of the summons, the number will remain down until his return, and render a second summons unnecessary."

Claim.—"What I claim as my invention, is the particular combination and arrangement of the sliding bars, pall, bent levers, hammer, bell levers, tumblers, bars, springs and case, made with aprons, arranged at different levels and projections in the manner and for the purpose set forth, by which an alarm is given simultaneously with exposing the number, and causing it to remain exposed, until drawn in and concealed by the person summoned, or other person in attendance."

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47. For an *Improvement in Iron Hurdle Fence;* Matthias P. Coons, Lansingburg, Rensselaer county, New York, October 17.

Claim.—"What I claim as my invention, is the manner of constructing the fence, having bars of iron bent staple formed at their ends, so as to pass through mortises or holes, prepared in the posts to receive them, where they are secured in place by means of rods passed through the eyes of the said staples in the manner set forth. The upper fence bar also passing over pins at the upper ends of the posts, and the respective parts being combined with each other substantially as set forth; by which arrangement and combination, said fence may be speedily packed in a very small compass and readily restored to use."

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48. For an *Improvement in Door Springs;* Thomas Peck, Syracuse, Onondaga county, New York, October 17.

The patentee says,—"The nature of my invention consists in providing a cam rod or rail of triple curvature, and affixing it upon the lintel or frame above the door, and of affixing a spring on the door in combination with a traveling rod or arm, which has a grooved pulley on one end of the same, which traverses the cam rod or rail previously referred to, and thereby graduates the power of the spring in acting upon the door, to close the door in a more simple and perfect manner than any heretofore known."

Claim.—"What I claim as my invention, is the peculiar formed cam rod or rail, in combination with the traveling arm and the pulley, for the purpose substantially set forth."

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49. For an *Improvement in Dentists' Instrument for Extracting Teeth;* Charles H. Dubs, Natchez, Adams county, Mississippi, October 17.

Claim.—"What I claim as my invention, is the combination of the notches of the screw, with the catch of the click, by means of which the screw affords additional power in extracting roots of teeth as set forth."

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50. For an *Improvement in Dentists' Drills;* Kirby Spencer, Athens, Clark county, Georgia, October 17.

Claim.—"What I claim as my invention, is, 1st, the combination of the hollow tapered tube, as a protecting case for the gearing, as set forth.

"2d, I claim the combination of the endless chain or belt, pulley, pinion, piston, propelling rod, segmental box, and segmental head with a hollow tapered tube, constructed in the manner set forth, for revolving the excavators, or rose drills, &c., for the purpose of excavating teeth angularly as set forth.

"3d, I claim the guide rail in combination with the tube as set forth."

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51. For an *Improvement in Manufacturing Artificial Flowers;* Caroline C. Nichols, Providence, Rhode Island, October 17.

Claim.—"What I claim as my invention, in the manufacturing an artificial flower, or the corolla thereof, is making the same of helix of floss silk, combined together, and with circular bases or pieces of cloth or paste board, substantially as set forth."

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52. For an *Improvement in Window Curtain Suspensions;* G. H. Marden, Charlestown, Middlesex county, Massachusetts, October 17.

The patentee says,—"The nature of my invention consists in providing an oscillating block or blocks on which the window shade is hung, as the said shade can be moved backwards and forwards on the roller on which it is fastened, so as to allow the window sash to be moved up the full length of its plane, and also to allow window shutters to close freely."

Claim.—"What I claim as my invention, is the metallic oscillating, or swinging blocks, as set forth."

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53. For an *Improvement in Cutting Files;* Nathan Starr, Middletown, Middlesex, Connecticut, October 17.

Claim.—"What I claim as my invention, is the combination of the cutters and drops with the revolving planes, by means of which the file blank is cut as it is advanced, by means of the feeding apparatus, composed of an excentric, hand, ratchet wheel and screw, substantially as set forth. I also claim the combination of the lever, adjustable cutter, excentric, hand, and ratchet wheel and screw, the whole forming a machine for cutting and finishing a file."

54. For an *Improvement in Lamps;* Samuel Rodman, New Bedford, Bristol county, Massachusetts, October 17.

The patentee says,—"My invention consists in an improvement on the argand lamps, which is in substituting for the tubular woven wick, a series of small wicks passing through perforations drilled in a heavy metallic tube, surrounding the central air tube."

Claim.—"What I claim as my invention, is the combination and arrangement of the heavy metallic tube or burner, having longitudinal perforations filled with a series of wicks, with the central air tube, substantially as set forth."

55. For an *Improvement in Making Mills and Skeleton Dies for Printing;* Thomas Paton, Providence, Rhode Island, October 24.

Claim,—"What I claim as my invention, is my improved method of making the mill, the same consisting, 1st, in making on the die, and in incavo the bondage and a ground space without the ground figures; next in milling the entire curved surface of the mill, by a separate milling cylinder or tool; next, pressing and rolling the die and mill together, so as to sink or produce on the latter an impression of the bondage, and figure portions, and leave the entire ground of the mill in relief, as set forth."

56. For an *Improvement in Saddles;* Robert Caldwell, Nashville, Davidson county, Tennessee, October 24.

The patentee says,—"The nature of my invention consists in the construction, arrangement, and attachment of the cantle so as to allow it to have a spring, and in strengthening the side bars at that point, and also in the manner of fastening the pads to the tree without nailing."

Claim.—"What I claim as new, is connecting the cantle with the side bars by means of plates, so that it is supported by springs and can move up and down, substantially as set forth. I also claim attaching the pad to the tree in the manner by means of the pocket loops, and without the aid of nails, as set forth."

57. For an *Improvement in Cutting Irregular Forms in Wood;* D. George and H. Robertson, Granville, Licking county, Ohio, October 24.

Claim.—"What we claim as our invention, is the combination and arrangement of the mechanical devices, as set forth, attached to the reciprocating carriage for turning the pattern and piece of wood, to be shaped simultaneously, a segment of a circle at the end of each reciprocating movement of the carriage, with the cutters contained in the revolving cylinders arranged in the vertical swing frames attached to the main frame by which the spoke, or other article to be shaped, will be dressed to a form approximating to that of the pattern, as set forth."

58. For an *Improvement in Apparatus for Raising Water;* J. J. Vedder, Schenectady, New York, October 24.

The patentee says,—"The nature of my invention consists in applying friction rollers to turn the buckets to a proper position, and in a guard suspended over the spout to prevent the water from being thrown over, as the buckets are tilted, and lastly, the connected pawls or dogs to prevent accident while drawing water."

Claim.—"What I claim as my invention, is the guard plate, arranged substantially as set forth."

59. For an *Improvement in Moulding Glass;* New England Glass Company, assignees of Jos. Magoun, Cambridge, Middlesex county, Massachusetts, October 24.

Claim.—"What I claim as new, is one or more lateral movable or retractive parts or pistons as combined with the remainder of the matrix, or stationary part of the mould and made to operate therewith, substantially as set forth."

60. For an *Improvement in Boot Trees;* Jarvis Howe, Worcester, Worcester county, Massachusetts, October 24.

Claim.—"What I claim as my invention, is the combination of the swivel and turning journal and its bearing with the frame boot tree, and mechanicism for distending the parts of the leg, as set forth. I also claim the peculiar arrangement of the boot tree upon its supporting stand."

61. For an *Improvement in Pessaries;* John R. Rowand, Philadelphia, Pennsylvania, October 24.

Claim.—"What I claim as my invention, is the thin, flat, broad, tapering elongation, or flap, descending from the bottom of the cup of the pessary, intended to occupy the uterus half (or more) of the vaginal canal, thereby more effectually to preserve the uterus (which reposes by its mouth or lips upon the cap) in situ; and also for such a combination of the flap, cup and perforation as are incidental to the flap pessary; using any appropriate substance for the construction of the instrument."

62. For an *Improvement in Brick Presses;* James Dane, West Derby, Orleans county, Vermont, October 24.

Claim.—"What I claim as my invention, is the mode of discharging the filled moulds by means of a combined spring lever, cam shaft, curved discharging arm, and treadles, arranged and operating in the manner and for the purpose set forth."

63. For an *Improvement in Ships Lights;* Enoch Hidden, City of New York, October 24.

Claim.—"What I claim as my invention, is securing the caoutchouc by baking and compression in the creased groove of the casing, to form an elastic seat for the glass frame to be shut down and compressed upon, to make a water tight joint."

64. For an *Improvement in Lamp Tops;* Seth E. Winslow, Kensington, Philadelphia county, Pennsylvania, October 24.

The patentee says,—"The nature of my invention consists in providing a lamp top with two wick holders, one holding a wick which extends down to the fluid contained in the lamps, resting upon or within a ledge contained in the lower half of the lamp top, or resting on the lamp within the said half. And the other wick holder made in the usual form, but so enlarged as to hold a quantity of wick which in being screwed down brings the wick in contact with the wick of the lower wick holder, making one continuous wick. The said upper wick holder can be removed when it is lighted, and be used as safely as any other lamp, to give light during the refilling of the lamp."

Claim.—"What I claim as my invention, is the manner of employing the separate wicks as set forth, so that when filling the lamp the lighted portion of the wick may be removed and avoid the risk of explosion."

65. For an *Improvement in Drilling Rock;* Matthias P. Coons, Lansenburg, Rensselaer county, New York, October 24.

Claim.—"What I claim as my invention, is the particular manner set forth of constructing the grippers, and combining them with the latch lever, and with the slide, under an arrangement of parts, substantially as set forth. I also claim the particular manner in which I give a rotary motion to the drill shaft, by means of the rod, extending from the standard as described."

66. For an *Improvement in Machines for Creasing Leather Straps;* Samuel Cronce, Flemington, Hunterdon county, New Jersey, October 24.

Claim.—"What I claim as new, is the particular manner in which I have arranged and combined the respective parts; that is to say, I claim, in combination, the adjustable creasing rollers on the shaft, the roller, and the guide strips, so as to co-operate in effecting the purpose made known."

67. For an *Improvement in Horse Rakes;* Eli Saunders, Weatherfield, Windsor county, Vermont, October 24.

Claim.—"What I claim as my invention, is the manner of applying the counterbalance box, (viz. by affixing it to arms or other proper contrivances projecting directly from *the rake head frame, and over and in front of the axle,)* in combination with the manner of sustaining the rake head, that is to say, by a rocker to rest, and rock upon the axle, as set forth; the said improvement taking off all downward strain of the counterbalance on the shafts and back of the horse, and thereby enabling the animal to work to better advantage than he could were the weight of the counterbalance or any part thereof to be thrown on him. Besides this the simplicity of the machine, and ease of operation of it, renders it superior and less costly in construction than most others of the kind in common use."

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68. For an *Improvement in Wire Fences;* Zephaniah Knapp, Pittston, Luzerne county, Pennsylvania, October 24.

The patentee says,—"My improvement consists in providing a means of securing the horizontal wire rods of the fence to the vertical posts of the same, of such a nature as to firmly connect them where they intersect each other, and draw the wire rods taut, and allow of the wires being withdrawn when it is desired to replace a broken wire, or for other purposes."

Claim.—"What I claim as my invention, is the mode of securing the wires to the posts, and straining them between the same by means of wedges or keys driven into mortices or slots, formed in the posts, above the wires, and causing them to be bent downwards into the lower parts of said mortises or slots, as set forth, whether said slots be formed at right angles to the wires, or parallel with the same. I also claim the combination of the oblong keys, having cogs or protuberances on their lower edges, and keys above the same, and longitudinal mortises or slots in the posts with the wires running parallel with the same, as set forth."

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69. For an *Improvement in Working Lock Gates by Water Power;* Lyman P. Judson, assignee of J. D. Willoughby, Susquehanna Post Office, Dauphin county, Pennsylvania, October 24.

Claim.—"What I claim as my invention, is, 1st, opening and closing the gates and wickets of canal locks, by the power of the waste water, applied by means of a combination of over shot wheels, affixed to horizontal shafts, having the buckets of every alternate wheel arranged in opposite directions for the purpose of reversing the motion of the wheels for opening and closing the gates, said wheels being made to act upon the gates through the agency of a combination of cog wheels, shafts, rack rods, pinions, cranks, and rods, arranged and operated as set forth.

"2nd. I claim the combination of the revolving shaft, cams, cranks, cords, with the levers, gates, and floom, for letting the water on to the wheels; the several parts being arranged in the manner and for the purpose substantially as set forth."

"3rd. I claim the combination of the vertical shaft and cogged wheels, and the racked bars with the cog wheels, pinions, cogged stems attached to the wicket gates for opening and closing the main gates, and the wicket gates therein, by the turning of the water wheels, as set forth.

"4th. I also claim the combination of the crank rods and connecting rods with the cog wheels, rack rods, and shaft, turned by the water wheels for opening and closing the lower gates and their wickets, as set forth.

"5th. I likewise claim the combination of the rods with the gates and cranks for turning the cam shaft, by the opening and closing of the gates to which the rods are attached, as set forth."

70. For an *Improvement in Shingle Machines;* John Turner, St. Albans, Somerset county, Maine, October 31.

Claim.—"What I claim as my invention, is the dogs operated by the gate or carriage, in combination with the knives and cutting gauges, as arranged and set forth."

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71. For an *Improvement in Fastenings for Pantaloon Straps, &c.;* W. W. Riley, Columbus, Franklin county, Ohio, October 31.

The patentee says,—"The nature of my invention consists in constructing a snap or catch in such manner, as when adapted and designed for pantaloons, one part can be sewed or buttoned on to the pantaloons, and the other by *pressure* fastened and unfastened at the will and control of the wearer, both parts adapting themselves without liability to injury by bending to any required form or position of the foot, and permitting as free use of the ancle as any other strap now in use."

Claim.—"What I claim as my invention, is the instrument as described for pantaloons, and the principle for use in the connexion of bracelets, gold chains, and other articles of dress and military trappings."

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72. For an *Improvement in Water Doors for Steam Boilers;* Isaac W. Ayres, City of New York, October 31.

Claim.—"What I claim as my invention, is the water door, so arranged as to have a continuous circulation passing through it, in combination with steam boilers or furnaces; and I also claim the mode of connecting the same to the head of a steam boiler or furnace, in the manner and for the purposes set forth."

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73. For an *Improvement in Insulating Supports for Telegraph Wires;* L. R. Livingston, J. J. Roggins, and Calvin Adams, Pittsburgh, Allegheny county, Pennsylvania, October 31.

Claim.—"What we claim as our invention, is our improved insulating supporter for telegraph wires; composed of the metallic supporter, the glass insulator, and the roof, combined with each other and with the post, substantially in the manner set forth."

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74. For an *Improvement in Cooking Utensils for Boiling and Steaming;* James Stevens, Middletown, Frederick county, Maryland, October 31.

Claim.—"What I claim as my invention, is constructing culinary vessels for boiling or steaming, with two projecting bottoms or heating surfaces, on adjacent sides, so that by merely changing its position the vessel is converted from a boiler to a steamer, or from a steamer to a boiler, as set forth."

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75. For an *Improvement in Looms;* James Haworth and John Haworth, near Frankford, Philadelphia county, Pennsylvania, October 31.

Claim.—"What we claim as our invention, is, 1st. The combination and arrangement, and organization, and operation of mechanism for stopping the loom when the filling or weft breaks, said combination consisting of the forked finger that rests against the filling when not broken, and which passes through the grating in the lay when the filling breaks, and causes the loom to stop; the short rock shaft to which the forked finger is affixed, arm, connecting rod, arm, finger shaft, finger, and spring, in combination with the stop lever, against which the finger strikes, causing the lever to turn on its fulcrum, and actuate the belt shipper for casting off the belt from the fast to the loose pulley, and thus stop the loom.

"2nd. We also claim the combination, and arrangement, and operation of the before described mechanism for actuating the picker staves, for throwing the shuttles without the use of picking treadles, straps, and other appendages usually employed for such purposes, said combination consisting of forked rock shafts, to which the picker staves are connected, the short axles passing through the picker staves into the forks of the rock shafts; the T shaped bars attached to the rock shafts and the rollers on the cranks, projected from the shafts for turning the rock shafts, alternately, as set forth; the picker staves being free to turn in the arc of a circle, in the direction of the movement of the lay, as well as in the direction of the throws of the shuttle simultaneously."

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76. For an *Improvement in Flyers for Roving Cotton;* Thomas Marques, City of New York, October 31.

The patentee says,—"My improvement consists in a seat and guide fitted to the leg of the flyer of the machines, for roving and slubbing cotton, so as to conduct the sliver and afford any required pressure upon the bobbin, without the intervention of a spring or springs."

Claim.—"What I claim as my invention, is the mode of moving and pressing the guide of the flyer (of a machine for roving and slubbing cotton) inwards so as to conduct the sliver to the bobbin without the use of springs, as set forth."

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77. For an *Improvement in Hanging Runner Stones in Mills;* Nathaniel Oakley, Babylon, Suffolk county, New York, October 31.

Claim.—"What I claim as my invention, is the balancing of runner mill stones, when at rest or in motion, by the introduction of a metallic ring as set forth, in combination with the improved form of the rynd or suspending bar and the mode of adjusting and fixing it in the eye of the runner stone, together with the mode of connecting the driver to the suspension bar, all as set forth."

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78. For an *Improvement in Hand Drills;* Stephen B. Crum, assignee of John Johnson, Somerville, Middlesex county, Massachusetts, Oct. 31.

Claim.—"What I claim as my invention, is the friction bands or clasps (or an equivalent spring band) and the toggle, in combination with the lever and its arms, and the drill stock, the whole being arranged, constructed and made to operate together, substantially as set forth."

79. For an *Improvement in Alloys for Sheet Metals;* Timothy D. Jackson, Brooklyn, Kings county, New York, October 31.

The patentee says,—"The materials employed by me in making this alloy are as follow:—Take of copper 64 ounces, zinc 22 to 26 ounces, india tin 1 to 4 ounces."

Claim.—"What I claim as my invention or discovery, is the application of the manipulations employed for compounding an alloy of metals in the proportions and of the materials mentioned for a new sheet metal, which shall be capable of being wrought in the cutting press, with dies &c., substantially as set forth."

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80. For an *Improvement in Shoe Pegging Machines;* Joel Robinson, Methuen, Essex county, Massachusetts, October 31.

Claim.—"What I claim as my invention, is, 1st, holding the shoe on rocking, turning, or moving stocks, in the proper position to be pegged, whether the same be constructed, arranged, and operated as set forth, or in any other manner substantially the same.

"2nd. I also claim the simultaneous intermittent movement of the carriage and stock, by means of the cogged and grooved guide pattern and transversing guide shaft and pinion, for the purpose of arranging the pegs at uniform distances apart in lines round the sole of the shoe, and parallel to its edge, whether the same be constructed, arranged and operated in the manner set forth, or in any other substantially the same. I also claim the employment of the turning tube for the purpose of receiving the pegs from the charger, and then placing them over the holes punctured in the sole of the shoe by the awl, in the proper position to be driven therein, whether the same be made and operated as set forth, or in any other way substantially the same. I also claim the manner of supplying the turning tube with pegs from the charger, at suitable intervals, by means of a vibrating driver, as set forth. And lastly, I claim the employment of a spiral chamber or groove to contain the pegs, and supply them to the charger, one at a time, by the simultaneous intermittent action of the traversing pusher and ratchet wheel, or otherwise, in combination with the charger, driver, turning tube, awl, and punch, arranged and operated in the manner and for the purpose set forth. And I wish it to be distinctly understood that I do not claim the spiral chamber, nor its use as a supplier, as it has been used for percussion caps in fire arms, provided with a transversing pusher similar to mine, but I merely claim its employment, in combination as set forth, for supplying pegs for pegging shoes."

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81. For an *Improvement in the Manufacture of Alkaline Chromates;* Richard A. Tilghman, City of Philadelphia, Pennsylvania, October 31.

Claim.—"I claim as my invention making the chromates of potash and soda, by exposing a mixture of the sulphates or muriates of those alkalies respectively with chrome ore, and either with or without lime, at a red heat to a current of steam and an oxidizing atmosphere. I do not claim making the chromates of potash and soda by heating together the sulphate of potash or soda, chrome ore and lime without the use of steam. I also claim making the chromate of potash, by heating to redness a mixture of a potash felspar, lime or its carbonate, and chrome ore in an oxidizing atmosphere. I also claim making the chromates of baryta and strontia by exposing a mixture of the sulphates or muriates of those bases respectively with chrome ore, at a high heat, to a current of steam and an oxidizing atmosphere."

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82. For an *Improvement in Saw Mills;* William Fink, Williamsport, Lycoming county, Pennsylvania, October 31.

Claim.—"What I claim as my invention, is, 1st, the method of changing the motions of the carriage to feed or gig back by the employment of the transverse sliding frame, containing the feed hands, and tappet wheel and pinion, which latter traverses the lines of cogs on the head and tail blocks, and those on the side of the carriage for resetting the log, which feed hands advance the carriage to the saw, whilst the motions of the saw and carriage are continuous and uninterrupted, except by momentary pauses, consequent upon engaging the pinion with the racks of the tail blocks and carriage, and disengage it from the rack of the head block, as set forth.

"2nd. I also claim the combination of the double excentrics on the levers with the single excentrics for moving the slide to which the log is dogged to the right or to the left, by inclining the lever to the right or to the left, and causing the arm of the transverse sliding frame to actuate the excentric, previously to the reversing the movement of the carriage, and whilst the saw is in the groove of the head block, for setting the log at the head block.

"3rd. I claim the employment of the shaft, pinion, and tappet, cog wheel, and arm, in combination with the main shaft for operating the carriage and transverse sliding frame, and other parts, as set forth.

"4th. I claim the employment of the transverse sliding frame in combination with the propelling shaft, pinion, and racks for setting the log on the head block, and changing the motion of the carriage, as set forth.

"5th. I claim the method of adjusting the rack for the purpose of leaving a stub short on the boards, by bringing the rack into gear with the pinion, before the saw has passed through the log, and also the method of sawing boards *without* stub short, by bringing the rack into gear with the pinion, after the saw has passed through the log and entered the groove of the *tail* block, effected by moving the slide towards or from the saw, and securing it permanently to the tail block by the pin, which is inserted into a hole in the slide.

"6th. I claim the employment of the shield in combination with the ratchet bar and carriage, for preventing the action of the feed hands upon the carriage during the operation of setting large logs by hand."

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83. For an *Improvement in Hydraulic Apparatus for Transmitting Power;* David Hinman, Brunswick, Medina county, Ohio, October 31.

Claim.—"What I claim as my invention, is the method substantially as set forth, of transmitting power from any one point to another, by means of the two vibrating rings with the two columns of water interposed, substantially as set forth."

84. For an *Improvement in Wagons;* John Mills, Pitt Township, Allegheny county, Pennsylvania, October 31.

Claim.—"What I claim as my invention, is the use of the strips to support the body of the wagon off the wheels, in combination with the cams to elevate and lower the wagon body off the wheels and running gears, substantially in the manner set forth."

MECHANICS, PHYSICS, AND CHEMISTRY.

For the Journal of the Franklin Institute.

An Essay on the Physics of Steam. *By* Thos. Prosser, C. E., *New York.*

The object in view in the following remarks, is to elucidate some of the mysterious actions of steam, but more particularly in reference to its economic value as a motor, in the steam engine, when working expansively.

It has not, therefore, been thought desirable, to make the title cover more ground, for instance, the electricity and electro chemical operations of steam, which may be incidentally touched upon, merely to connect with, but not to explain, which must be left until another time, and it may be to abler hands.

Reasoning "by analogy," has probably been the cause of as much erroneous doctrine in the church, as any other thing which can be named, and so long as the churchmen were the principal depositaries of science, it was to be expected that this same source of error would be carried there also, but their science was principally of the speculative kind; and yet, we find grave professors of the exact sciences of the present day, with the old abomination of substituting fancy for fact. I will instance the fact of high pressure steam not scalding the hand. The explanation given in the books, to account for this phenomena is, "by analogy," the production of cold by expansion. It is admitted that low pressure steam will scald, and therefore the "analogy" will not hold good, unless the cold produced is lower than the temperature of such steam; accordingly we find a writer in this journal, who puts it at 88°; *(Vol.* xii. *3d series, p.* 193;*)* he says that steam at 360° F. "expanded to the atmosphere should be 88°. It would therefore rush into the air, and immediately assume the form of water." Now as it appears to me, the very reverse of this is the fact, that is to say, the steam will not condense, and assume the form of water, in consequence of the expansion, and hence, it will not scald the hand.

When steam is generated under the pressure of the atmosphere into which it is permitted to escape, whatever of electricity may be evolved is conveyed back to the water from which it was generated, in consequence of the conducting power of such steam, and the hand which is placed in it becomes scalded; because such steam having no power of expansion, must instantly condense on any substance colder than itself which may be presented to it; but the air, if fully saturated with moisture at the time, will not take up a particle of it, and therefore it must fall down in a fine shower as rapidly as the particles of air and steam come in contact with each other, and the temperature at the instant of condensation of the steam will be scarcely less than 212°, although it will almost instantly assume that of the air through which it falls, and which continually presents fresh cool air to its finely divided particles. The insensible or latent heat which it has given out, from the state of vapor to become water, will amount to 1000° or six times as much as would raise the temperature of the same weight of water 167°.

High pressure steam, on the other hand, is almost the very reverse of this, in every particular except the last, that is to say, the same weight of steam will raise the temperature of a given weight of water in the same degree, whatever may be the pressure of the steam. This is commonly known as the law of Watt, and has been proved experimentally by M. Clement and others; and although the recent laborious experiments of M. V. Regnault show that it is not correct, it is nevertheless likely to maintain its position among practical men, on account of its simplicity and sufficient accuracy for ordinary purposes. The experiments of Pambour are said to confirm the law of Watt, inasmuch as steam, "under an absolute pressure varying from 2·7 to 4·4 atmospheres, and escaping into the atmosphere under an actual pressure of from 1·4 to 1·03 atmospheres, presented at its issue exactly the same temperature, as though it were saturated."

These experiments, however, appear to me as proving just the contrary, and support M. V. Regnault's experiments, although it appears to have been entirely overlooked.

If steam after expansion presents the same temperature that is due to saturated steam, at the pressure under which it is expanded, then it is clear that such steam is not saturated but surcharged, because it is a well settled fact, that the density of steam does not increase in so high a ratio as its elasticity, and hence the temperature of expanded steam being higher than is due to the quantity of water it contains, proves that the total heat must be greater in high than in low pressure steam. To give a familiar example, take 100 cubic inches of steam at the pressure of the atmosphere, the temperature 212° F., the weight will be 14·9620 grains, take now also 50 cubic inches at twice that pressure, the temperature will be 250·52° Farh., but the weight will be only 14·1376 grains.

Again, the weight of 100 cubic inches of steam at 4 atmospheres pressure is 53·2574 grains, temperature 293·72°; expanded into 4 volumes, 100 cubic inches will weigh 13·31435 grains, the temperature due to which as saturated steam is 205°, and the pressure ·8633 atmosphere; such must be the result if the law of Watt be true, but the experiments of Pambour, before alluded to, show that such steam will issue into the atmosphere, at the temperature of 212° Fahrenheit, notwithstanding the cooling it must experience, in passing through the engine, and the improbability of its having entered it perfectly dry.

But one conclusion appears possible, the high pressure steam contains the most heat; during expansion, the surplus heat goes to surcharge the steam, and make it "dry," and like hot air at a high temperature, the hand may be held in it with impunity.

According to M. V. Regnault, at 212° the total heat of steam is 1146·60, at 205° it is 1142·57, and at 293·72° it is 1170·72. We have therefore about 28° of heat in steam when expanded four times, more than is due to the water which it contains; the temperature therefore becomes 233° instead of 205°, and the pressure 1·0246 instead of ·8633 atmosphere; no cold is therefore produced by the expansion of steam, as is the case with air. The capacity of high pressure steam for heat, is greater than that of a lower pressure, which is just the reverse of air, and the gases generally. Steam, therefore, will not bear compression, because it does not contain a sufficiency of heat under a low pressure, to supply the demands of a higher one; and now having arrived at two of the causes which render the working of steam expansively so economical in the Cornish, or any other working by expansion and at a slow speed, viz. the surcharged state of expanded steam, and the liability to condensation by pressure of saturated steam, I close the present chapter, as I hope without having scalded my hand.

Report on the Gases evolved from Iron Furnaces, with reference to the Theory of the Smelting of Iron. By Prof. Bunsen, *of Marburg, Hesse Cassel, and* Dr. Lyon Playfair, *of the Museum of Economic Geology, Department of Her Majesty's Woods and Forests.*

From the Report of the British Association for the Advancement of Science, for 1845.

(Continued from page 32.)

Theory of the Hot Blast Furnaces.

The previous inquiries have led us to a knowledge of the average composition of the furnace-gases, as they are produced during the processes in operation in various parts of the furnace. We have endeavored to point out the influence exerted on the average composition of the gases by the materials introduced into the furnace, the ultimate products of all of which changes appear at the mouth of the furnace. We now proceed to the most important part of our inquiry, by endeavoring to elucidate the nature and mutual relation of all the processes in the reduction of iron. To obtain a knowledge of them, it was necessary to become acquainted with the changes suffered by the ascending column of air from the blast to the mouth of the furnace. We have collected the gases from various depths of the furnace, in the manner employed by one of us in his inquiries into the theory of German furnaces in which charcoal is used as fuel. This method has been more lately used by Ebelmen, with several changes which we have been compelled to reject, because in them he introduced a source of error which vitiated his results.

The apparatus for collecting the gases in our experiments consisted of a system of tubes, twenty-six feet in length, made of soft malleable iron. The tube was one inch in diameter, and consisted of pieces of five feet in length, screwed together so as to be air tight. The depth of the tube in the furnace was known by white marks placed at the distance of one foot, and we found that about three of these sunk in an hour during the first part of the experiment, although more slowly afterwards. The top part of the tube was furnished with a lead pipe, through which the gases were conducted to a place fit for experiment. The system of tubes was balanced by a chain passing over a block fixed to a stout wooden upright, and fastened by chains round the furnace. The strong heat of the flame issuing from the top of the furnace rendered it necessary to wet the support from time to time, and this was effected by a fire-engine placed at some distance on the platform. The gases themselves were collected in glass tubes, four inches long and $\frac{3}{4}$-inch wide, these tubes being drawn out at both ends and connected with each other, and also with the lead tube, by caoutchouc joints. The pressure of the gas, which often amounted to several inches of water, was too powerful to allow the glass tubes to be hermetically sealed while they remained in connexion with the lead pipe. We therefore found it necessary to heat the tubes, so as to expand the air to a certain extent, then to tie the caoutchouc joints, and not to seal the tubes hermetically until they had cooled down sufficiently to prevent any small explosion during the melting of the glass. A vertical section of the furnace upon which our experiments were made is represented in fig. 6; it of the usual size of furnaces in this country, and is supplied with air heated to 626° Fahr., 330° C. This air passes into the furnace under a pressure of mercury of 6·75 inches, out of a nozzle of 2·75 inches in diameter. The iron ore melted in this furnace is an aluminous sphareosiderit, which is previously roasted so as to free it from moisture and carbonic acid, and by this means is converted into argillaceous peroxide of iron. The furnace is supplied with eighty charges in the course of twenty-four hours; each of these charges, as we have already mentioned, consisting of 420 lbs. of calcined ironstone, 390 lbs. of coal, and 170 lbs. of limestone, the product of which is 140 lbs. of pig iron. The limestone is broken up into pieces about the size of the fist before being introduced into the furnace, but the coal and ironstone are projected in lumps which not unfrequently weigh above 20 pounds. Iron ore and limestone are thrown into the furnace without any previous mixture. We have collected the gases in all the regions below and above the zone of fusion, for in the latter the collection was impossible, owing to the high temperature, which softened the tubes, or melted them completely. Although the gases under the zone of fusion are actually at a higher temperature than they are at that point of the furnace, we succeeded in obtaining them by boring through the *Front* over the hearth of the furnace, and introducing an iron tube.

The gases collected over the zone of fusion were first examined, and gave the following results:—

Experiment I.

The depth of the tube was five feet below the upper stratum of fuel and materials. The gases issuing from the tube possessed a peculiar smell, different to that of coal gas, but very similar to the characteristic odor of acrolein; they burned with a yellowish red flame, but were not accompanied with brown vapors of tar. Number of charges, 6.

A. *Estimation of Olefiant Gas and Carbonic Acid.*

	Volume.	Pressure.	Temp.	1 m. at 0° C.
Gas used	132·0	0·6558	12·0°	82·93
After absorption of olefiant gas	131·5	0·6550	11·8	82·57
After absorption of carbonic acid	122·4	0·6471	11·0	76·13
B. *Examination of the Gas freed from Olefiant Gas and Carbonic Acid.*				
Gas used	125·2	0·4626	11·0	55·67
After admission of O	205·8	0·5452	11·3	107·74
After combustion	179·6	0·5168	11·1	89·20
After absorption of CO_2	149·7	0·4946	10·0	71·17
After admission of H	321·6	0·6537	11·0	202·09
After combustion	179·6	0·5172	11·0	89·29

Nitrogen	55·35	Hydrogen	6·73
Carbonic acid	7·77	Olefiant gas	0·43
Carbonic oxide	25·97		
Light carburetted hydrogen	3·75		100·00

Experiment II.

The depth of the tube was eight feet. The blast had been interrupted for a whole hour previous to the experiment, but the gases were not collected until the furnace had been for some time in tranquil action. The flame and smell were exactly the same as in the first experiment. Number of charges, 14.

A. *Estimation of Olefiant Gas and Carbonic Acid.*

	Volume.	Pressure.	Temp.	1 m. at 0° C.
Gas used	105·4	0·6254	11·0°	63·36
After absorption of olefiant gas	104·6	0·6248	11·0	62·82
After absorption of carbonic acid	95·5	0·6173	10·1	56·85
B. *Examination of the Gas freed from Olefiant Gas and Carbonic Acid.*				
Gas used	125·4	0·4623	10·5	55·83
After admission of O	211·9	0·5680	11·0	115·70
After combustion	185·5	0·5221	11·0	93·10
After absorption of CO_2	155·3	0·5032	10·0	75·39
After admission of H	344·8	0·6767	10·5	224·36
After combustion	195·5	0·5342	10·9	100·43

Nitrogen	54·77	Hydrogen	6·49
Carbonic acid	9·42	Olefiant gas	0·85
Carbonic oxide	20·24		
Light carburetted hydrogen	8·23		100·00

Experiment III.

The depth of the tube in the furnace was eleven feet, and the gases evolved were accompanied by vapor of tar, and possessed the smell of coal gas. The flame was of a clear yellow, with a strong illuminating power. The number of charges was twenty-three.

A. *Estimation of Carbonic Acid and Olefiant Gas.*

	Volume.	Pressure.	Temp.	1 m. at 0° C.
Gas used	108·3	0·6377	9·0°	66·86
After absorption of olefiant gas	107·6	0·6357	9·0	66·22
After absorption of carbonic acid	98·8	0·6274	9·4	59·93

B. *Examination of the Gas freed from Olefiant Gas and Carbonic Acid.*

	Volume.	Pressure.	Temp.	1 m. at 0° C.
Gas used	131·0	0·4773	9·4	60·45
After admission of O	218·9	0·5639	9·4	119·33
After combustion	186·4	0·5322	9·4	95·90
After absorption of CO_2	155·7	0·5126	9·3	77·19
After admission of H	290·2	0·6336	9·3	177·82
After combustion	119·9	0·4540	9·5	52·60

Nitrogen	52·57	Hydrogen	9·33
Carbonic acid	9·41	Olefiant gas	0·95
Carbonic oxide	23·16		
Light carburetted hydrogen	4·58		100·00

Experiment IV.

The depth of the tube in the furnace was fourteen feet; the number of charges twenty-six; the smell of the gases was ammoniacal and tarry; vapors of tar were visible, and the flame was yellow, but of small illuminating power.

A. *Estimation of Olefiant Gas and Carbonic Acid.*

	Volume.	Pressure.	Temp.	1 m. at 0° C.
Gas used	124·2	0·6462	7·5°	78·12
After absorption of olefiant gas	121·0	0·6529	7·5	76·89
After absorption of carbonic acid	111·5	0·6430	7·5	69·78

B. *Examination of Gas freed from Olefiant Gas and Carbonic Acid.*

	Volume.	Pressure.	Temp.	1 m. at 0° C.
Gas used	147·2	0·4956	7·5	71·01
After introduction of O	232·6	0·5800	7·5	131·31
After combustion	188·4	0·5363	7·7	98·27
After absorption of CO_2	156·1	0·5108	7·4	77·63
After introduction of H	291·6	0·6361	7·7	180·40
After combustion	144·0	0·4927	7·7	69·00

Nitrogen	50·95	Hydrogen	12·42
Carbonic acid	9·10	Olefiant gas	1·57
Carbonic oxide	19·32		
Light carburetted hydrogen	6·64		100·00

Experiment V.

Depth of the tube in the furnace seventeen feet; thirty-two charges; the stream of gas, which had been interrupted for a short time, possessed a peculiar tarry smell. There were no vapors of tar, and the flame was yellow and only slightly illuminating.

A. *Estimation of Carbonic Acid and Olefiant Gas.*

	Volume.	Pressure.	Temp.	1 m. at 0° C.
Gas used	114·5	0·6414	11°·6	70·45
After absorption of olefiant gas . .	113·0	0·6412	11·7	69·48
After absorption of carbonic acid . .	99·0	0·6320	10·9	60·72
B. *Examination of the Gas freed from Olefiant Gas and Carbonic Acid.*				
Gas used	125·5	0·4740	12·0	56·99
After admission of O	213·4	0·5615	11·8	114·86
After combustion	186·2	0·5345	11·8	95·40
After absorption of CO_2	160·7	0·5197	11·5	80·14
After admission of H	332·6	0·6784	11·7	216·38
After combustion	171·4	0·5237	11·8	86·04

Nitrogen - - -	55·49	Hydrogen - - -	7·62
Carbonic acid - -	12·43	Olefiant gas - - -	1·38
Carbonic oxide -	18·77		
Light carburetted hydrogen	4·31		100·00

Experiment VI.

Depth of the tube twenty feet; thirty-eight charges. The gases were not accompanied by vapors of tar, they smelt ammoniacal and burnt with a pale blue flame.

A. *Estimation of Olefiant Gas and Carbonic Acid.*

	Volume.	Pressure.	Temp.	1 m. at 0° C.
Gas used	96·2	0·7284	12°·3	67·05
After absordtion of olefiant gas . .	96·2	0·7274	12·1	67·01
After absorption of carbonic acid . .	87·0	0·7175	12·2	59·75
B. *Examination of the Gas freed from Olefiant Gas and Carbonic Acid.*				
Gas used	113·9	0·4586	12·2	50·00
After admission of O	213·0	0·5590	12·7	113·78
After combustion	192·8	0·5391	12·7	99·32
After absorption of CO_2	169·8	0·5285	12·1	85·93
After admission of H	335·5	0·6777	12·7	117·27
After combustion	130·7	0·4890	12·2	61·18

Nitrogen - - -	60·46	Light carburetted hydrogen	4·40
Carbonic acid - -	10·83	Hydrogen - - .	4·83
Carbonic oxide -	19·48		
			100·00

Experiment VII.

Depth of the tube twenty-three feet; forty-two charges. The gas was unaccompanied by tarry vapors, but smelt slightly, although distinctly, of cyanogen, and burnt with a pale blue flame of no illuminating power.

A. *Estimation of Olefiant and Carbonic Acid Gases.*

	Volume.	Pressure.	Temp.	1 m. at 0° C.
Gas used	121·6	0·6517	8°·0	77·02
After absorption of olefiant gas	121·6	0·6517	8·0	77·02
After absorption of carbonic acid gas	113·0	0·6441	8·0	70·71

B. *Examination of the Gases freed from Olefiant Gas and Carbonic Acid.*

	Volume.	Pressure.	Temp.	1 m. at 0° C.
Gas used	134·9	0·4817	8·0	63·14
After admission of O	230·9	0·5770	8·0	129·46
After combustion	208·9	0·5560	8·0	112·86
After absorption of CO_2	180·1	0·5312	7·3	93·18
After admission of H	333·6	0·6720	7·7	218·03
After combustion	127·7	0·4730	7·8	58·75

Nitrogen	58·25	Light carburetted hydrogen	1·64
Carbonic acid	8·19	Hydrogen	4·92
Carbonic oxide	26·97		
			100·00

Experiment VIII.

Depth of the tube twenty-four feet; the number of charges and character of the gases were the same as in the last experiment.

A. *Estimation of Olefiant and Carbonic Acid Gases.*

	Volume.	Pressure.	Temp.	1 m. at 0° C.
Gas used	141·8	0·6562	10°·9	89·48
After absorption of olefiant gas	141·8	0·6562	10·9	89·48
After absorption of carbonic acid	128·3	0·6523	11·0	80·46

B. *Examination of the Gases freed from Olefiant Gas and Carbonic Acid.*

	Volume.	Pressure.	Temp.	1 m. at 0° C.
Gas used	139·7	0·4792	11·0	64·36
After admission of O	207·9	0·5479	11·0	109 50
After combustion	181·6	0·5215	11·0	91·05
After absorption of CO_2	148·1	0·5011	11·0	71·35
After admission of H	286·3	0·6267	11·2	172·36
After combustion	164·6	0·5075	11·5	80·16

Nitrogen	56·75	Light carburetted hydrogen	2·33
Carbonic acid	10·07	Hydrogen	5·65
Carbonic oxide	25·10		
			100·00

The gas which we collected within two feet nine inches of the tuyère, possesses such a remarkable composition that we are obliged to devote to it particular attention. The gases, although collected only two feet nine inches above the entrance of air, are entirely free from oxygen, and, what is still more remarkable, do not contain a trace of carbonic acid. Olefiant gas and light carburetted hydrogen could not be present, as the gases produced in the region of the furnace are evolved from materials long exposed to a white heat. Cyanogen, however, was found in the gaseous mixture in such quantity as to be quite sensible by its smell, and by giving the flame its characteristic purple color.

The analysis of the mixture was effected in the same manner as in the preceding cases, but it is necessary to use the following equations in the calculation of its composition.

We call the quantity of gas used in the analysis A, the quantity of its constituents hydrogen, carbonic oxide, cyanogen, and nitrogen, respectively x, y, z, n; and designate the oxygen used in the combustion as O, and that remaining after combustion as p, and the volumes of gas remaining after the combustion, and then after the absorption of the carbonic acid, as B and C; we then obtain the following expressions:—

$$\begin{aligned} \mathrm{A} &= x+y+z+n. \\ \mathrm{B} &= \mathrm{O}+n+z+\tfrac{1}{2}y-\tfrac{1}{2}x. \\ \mathrm{C} &= \mathrm{O}+n-z-\tfrac{1}{2}y-\tfrac{1}{2}x. \\ \mathrm{O}-p &= \tfrac{1}{2}x+\tfrac{1}{2}y+2z. \end{aligned}$$

The values of the unknown quantities deduced from these quotations are:

$$x = \mathrm{O}-\mathrm{B}+\frac{(\mathrm{C}-p+\mathrm{A}),}{2}$$

$$y = \mathrm{B}-\mathrm{O}+\frac{(\mathrm{A}-3\,\mathrm{C}+3p),}{2}$$

$$z = \frac{\mathrm{C}-\mathrm{A}+2\,\mathrm{O}-3p,}{4}$$

$$n = \frac{3\,\mathrm{C}-p+\mathrm{A}-2\,\mathrm{O}.}{4}$$

The gas collected six feet above the hearthstone of the furnace, and two feet nine inches above the tuyère, gave the following results by eudiometric analysis:—

	Volume.	Pressure.	Temp.	1 m. at 0° C.
Gas used	141·3	0·4935	8°·5	67·63
After admission of O	180·1	0·5323	8·5	92·98
After combustion	156·5	0·5083	8·7	77·10
After absorption of CO_2	110·1	0·4688	9·0	49·97
After admission of H	199·2	0·5493	9·0	105·93
After explosion	155·7	0·5077	9·0	76·53

The composition of this gas, calculated out of the preceding numbers by the equations just given, is—

Nitrogen - - - - -	58·05
Carbonic oxide - - - -	37·43
Hydrogen - - - - -	3·18
Cyanogen - - - - -	1·34
	100·00

If we calculate the proportion of the nitrogen (including also that in the cyanogen) to the oxygen contained in the gas, after subtracting a quantity corresponding to the hydrogen, we obtain the numbers 79·2 : 22·8, which differ only 2 per cent. from the quantity of oxygen in atmospheric air. Now, by calculating this gaseous mixture on the supposition that it does not contain cyanogen, and consists merely of nitrogen, carbonic oxide, carburetted hydrogen, and hydrogen, using the formulæ which we have provided for such cases, the following composition would result, which is not admissible under the circumstances in which the gas is formed:—

Nitrogen - - - - -	59·39
Carbonic oxide - - - -	38·33
Carburetted hydrogen - -	1·79
Hydrogen - - - - -	0·49
	100·00

Hence this calculation leads us to a composition in which nearly 2 per cent. of light carburetted hydrogen is present, an assumption which at once proves its inaccuracy, when we consider the point of the furnace at which the gas was collected. A consideration of the previous analysis explains the change suffered by the column of air in its ascent in the furnace.

Depth under the top . .	I. 5 feet.	II. 8.	III. 11.	IV. 14.	V. 17.	VI. 20.	VII. 23.	VIII. 24.	IX. 34.
Nitrogen . . .	55·35	54·77	52·57	50·95	55·49	60·46	58·28	56·75	58·05
Carbonic acid . . .	7·77	9·42	9·41	9·10	12·43	10·83	8·19	10·08	0·00
Carbonic oxide . .	25·97	20·24	23·16	19·32	18·77	19·43	29·97	25·19	37·43
Light carburetted hydrogen	3·75	8·23	4·57	6·64	4·31	4·40	1·64	2·33	0·00
Hydrogen . . .	6·73	6·49	9·33	12·42	7·62	4·83	4·92	5·63	3·18
Olefiant gas . . .	0·43	0·85	0·95	1·57	1·38	0·00	0·00	0·00	0·00
Cyanogen . . .	0·00	0·00	0·00	0·00	0·00	0·00	trace.	trace.	1·34

A glance at the tabulated results shows that light carburetted hydrogen must be considered an essential constituent of the gaseous mixture, even at a depth of twenty-four feet in the furnace. Now, as one of us has elsewhere shown that carburetted hydrogen can neither be formed by the direct combination of carbon with hydrogen, nor by the decomposition of water at the expense of the coals, it must be viewed as a product of distillation, a fact of considerable importance in the theory of the process of smelting in this country, and which leads to the following conclusion,—That the region of the furnace in which the coking of the coal is effected extends to a depth of twenty-four feet from the mouth.

When we consider that the coals are thrown into the furnace in large masses, sometimes 20 lbs. in weight, it will scarcely excite surprise that the space required by the coal, before being converted entirely into coke, is above one-half of the whole depth of the furnace.

The tabulated composition of the gases further shows that the quantity of nitrogen in the gaseous mixture, taken as a depth of fourteen feet, is at a minimum, while the olefiant gas, carburetted hydrogen, and hydrogen, is at a maximum. As the latter gases are formed from coal only under the influence of an elevated temperature, we draw from this circumstance the conclusion, that the process of distillation of the coal reaches its maximum at a depth of fourteen feet. We remarked, in describing the experiments in detail, that the gases were free from the vapors of tar to a depth of fourteen feet, but that they became richly laden with them on attaining a depth of seventeen feet. The absence of these vapors from the upper part of the furnace proves that they suffer decomposition as they pass through the upper lapers of red-hot coal. The water ascending through these layers must also suffer decomposition, and this fact explains the irregularity in the proportions between the carbonic acid and carbonic oxide.

When we compare with each other the different quantities of carbonic oxide and carbonic acid at various depths of the furnace, we see a complete absence of any mutual dependence, contrary to what was observed to be the case in the smaller German furnaces fed with charcoal. In order to understand this phenomenon, it is necessary to consider attentively the conditions under which the materials are exposed.

We have already seen that the coal has to travel twenty-four feet, from the mouth to the *boshes* of the furnace, before it is deprived of its volatile carbonaceous products, hygroscopic water, and water formed by the distillation. Now, even if we admit that the temperature in this part of the furnace is never so much lowered by the uninterrupted gasification of the coal as to prevent the reduction of the iron ore, by which carbonic oxide is converted into carbonic acid, still the ore would always be exposed, not only to the deoxidizing influence of the furnace gases, but also to the oxidizing powers of the steam evolved from the coal, which has escaped being coked. The projection of the coal into the furnace in large pieces has, therefore, the effect of subjecting the ore to a simultaneous reduction and oxidation, on account of which the relation between the carbonic acid, carbonic oxide, and hydrogen, is made to depend upon local circumstances in the upper part of the furnace. Now, when we further consider that the carbonic oxide and carbonic acid escaping from the mouth of the furnace, and from the part superior to the boshes, are almost in equal proportion, we are compelled to look for the cause of reduction of the ore in a region of the furnace still deeper. However, all doubt as to this fact disappears when we refer to the proportion between the nitrogen and oxygen of the gases collected. If the reduction of the ore and evolution of carbonic acid from the limestone had been completely effected above the point of the furnace to which we reached, the gases formed below would have contained their nitrogen and oxygen in the same proportion as in air, and would not have become richer in oxygen gas. But it will be seen that this is really not the case, by the following table of the varying proportions of oxygen and nitrogen in the gases collected from the various depths:—

Nitrogen .	79·2	79·2	79·2	79·2	79·2	79·2	79·2	79·2	79·2
Oxygen .	24·9	23·6	24·6	19·5	25·7	23·7	28·2	27·7	27·8

We see, from this series of numbers, that the relation of the gases, as regards their proportions from the mouth of the furnace downwards, is quite the reverse of that observed in the German furnaces. At first sight the circumstance strikes us as very inexplicable, because we do not know any chemical process in the furnace capable of diminishing the amount of oxygen contained in the gases; but we are enabled to explain this anomaly on an attentive consideration. The diminution of oxygen begins chiefly at the point where the gases generated by the combustion of coal become developed. The proportion of these gases to each other shows that, when liberated from the coal, they cannot mix quite uniformly with the column of air ascending from the lower parts of the furnace. Hence the gas collected at this region of the furnace is richer in the gaseous products of distillation of coal than would correspond to its average composition; the hydrogen, for example, actually increases to above 12 per cent. If we suppose, as we have done in the above numerical series, that the hydrogen is derived from the decomposition of water at the expense of the carbon, the quantity of oxygen could not decrease, whatever may be the proportion of the gases generated in this way at the various points of the furnace. But if, as we must suppose, the hydrogen is principally derived from the olefiant gas and empyreumatic oils decomposed by the high temperature, the calculation leads us to a smaller quantity of oxygen than really represents the truth. This fact warrants the conclusion,—That the mean composition of the gases *cannot* be determined at that point of the furnace where the evolution of gas by distillation is at its maximum.

The source of this uncertainty disappears in the deeper parts of the furnace, where the olefiant gas and the higher hydrocarbons are no longer present. The result obtained at the depth of twenty-three and twenty-four feet, giving the constant mean proportion 79·2 : 27, proves that under the twenty-four feet, there is an evolution of carbonic acid caused either by the reduction of the ore, or by the escape of carbonic acid from the limestone, or perhaps by both these causes together. Now we conclude, from the average composition of the gases evolved from the materials used in the furnace, that this evolution of carbonic acid is really owing to the reduction of the ore, and that the process of reduction takes place only in the boshes. The average composition must be somewhere between the following numbers:—

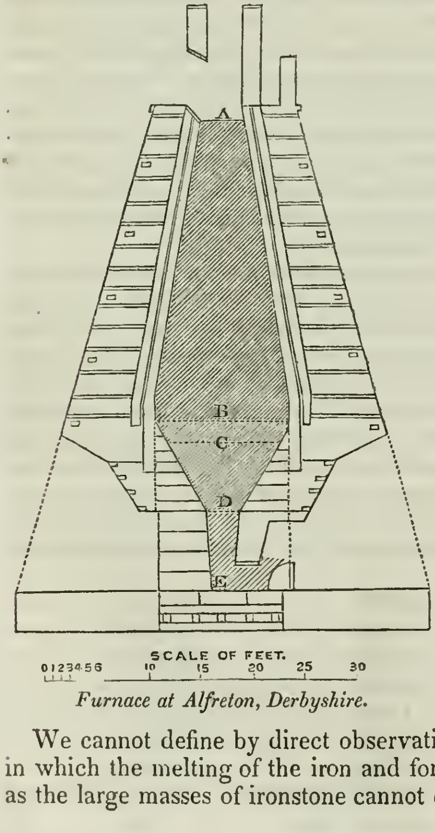
Nitrogen - - -	60·907	57·878
Carbonic acid - -	8·370	9·823
Carbonic oxide - -	26·846	24·042
Light carburetted hydrogen	2·536	2·743
Hydrogen - - -	1·126	4·972
Olefiant gas - - -	0·112	0·392
Sulphuretted hydrogen	0·045	0·035
Ammonia - - -	0·058=100·000	0·115=100·000

This mixture of gases contains,—

1. The products of distillation of the coal.
2. The products of its combustion.
3. The carbonic acid generated during the reduction of the ore, and expelled from the limestone.

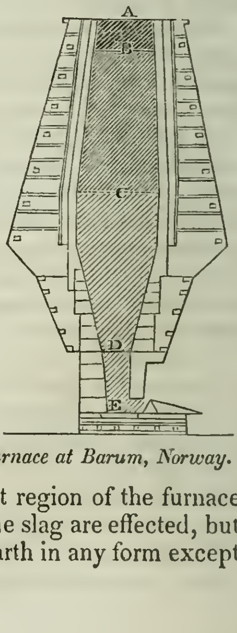
The proportion of nitrogen to oxygen, as deduced from these analyses, is 79·2 : 27·33, and 79·2 : 26·67, or an average of 79·2 : 27. The products of combustion of the coal give the proportion existing in atmospheric air 79·2 : 20·8. Now as the amount of oxygen in the products of distillation of the coal is quite insignificant, and may be safely neglected in the calculation, the increase of oxygen from 20·8 to 27 must depend upon the carbonic acid of the limestone, and the oxygen of the ore given to carbon during the reduction. But the gas collected at twenty-three and twenty-four feet deep, contains 27·6 and 26·5 oxygen to 79·2 nitrogen. Hence at this depth the gas must have already accumulated all the oxygen of the iron, and the carbonic acid of the limestone. These facts warrant us in drawing the following conclusion,—That in hot-blast furnaces fed with coal, the reduction of the iron and expulsion of carbonic acid from the limestone takes place in the boshes of the furnace.

Fig. 6.



Furnace at Alfreton, Derbyshire.

Fig. 8.



Furnace at Barum, Norway.

We cannot define by direct observation the exact region of the furnace in which the melting of the iron and formation of the slag are effected, but as the large masses of ironstone cannot enter the hearth in any form except as a liquid, we may safely assume that the point of fusion is at the top of the hearth in hot-blast furnaces.

With the object of rendering these processes more intelligible, we have shaded a section of the furnace so as to represent the different parts employed in their special functions, the drawing being made to an exact scale. A B is the space in which the distillation proceeds, B C and C D show the region in which the reduction of the ore and evolution of the carbonic acid are effected, and in which the materials attain the temperature necessary for fusion.

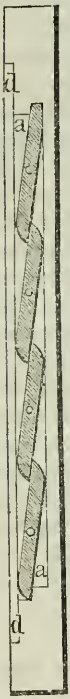
The marked difference between the results obtained in the continental furnaces and those in this country will cease to excite surprise, when we bear in mind the different nature of the fuel employed. The principal reason of the great depression of the region of reduction in the furnaces of this country, is that almost all the body of the furnace is taken up in the process of coking; and hence the point of reduction must be still further lowered if the pieces of coal be of a large size. These pieces, often in bulk equal to a cubic foot, must remain a long time before the heat penetrates thoroughly through them, and the column of air ascending through this material must yield its heat in order to render gaseous above 30 per cent. of the fuel. Hence the depression of the temperature of the upper half of the furnace becomes so great that it does not suffice for the reduction of the ore, nor is it sufficient for the expulsion of carbonic acid from the limestone. Another important cause lowering the region of reduction, is the high pressure at which the blast is thrown into the furnace, the pressure being six or seven times the amount of that used in Germany. The materials, on this account, traverse through the furnace much more speedily, and therefore require to pass through a larger space to become heated.—All these circumstances have much less influence in the German and Swedish furnaces. The charcoal with which the latter are fed is a fuel almost completely coked, and the materials, being in small fragments and thoroughly mixed, offer a heating surface at least a hundred times greater than that exposed in English furnaces. The small pressure of the blast also effects a slow combustion, so that the fuel frequently takes twice or three times the period to pass through the same region of the furnace.

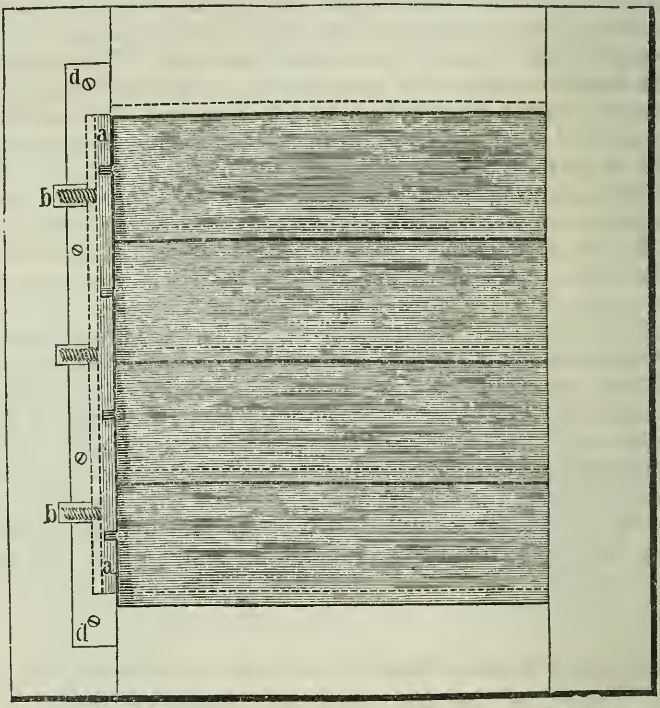
To be Continued.

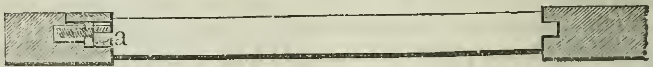
Description of Venitian Blinds Patented by John Hampson, Esq., *Civ. Eng., of Carrollton, Louisiana, August* 21, 1841.

The frame is made in the ordinary manner, with the exception of the inner edge of one side being rabbited, so as to allow a movable strip, *a a*, (see sketch,) to be placed therein, of about $\frac{3}{8}$ in. in thickness, and of such width as to allow holes to be made in it, for the pivots or journals, *e e*, of one end of the slats to work in. In the edge of the frame at the bottom of the rabbit, holes are bored, in which brass wire spiral springs, India rubber, or other elastic material, are placed, as shown at *b b;* these springs keep the strip *a a* close up to the end or shoulders of the slats, with just sufficient pressure to retain them in any position in which they may be placed, and prevent them from rattling or shaking down when they are used in railroad cars or carriages. To keep the strip *a a* in its place, and to hide the springs, a flat strip, (of the same kind of wood as the frame is made of,) *d d*, is let in and fastened with screws, as shown. This flat strip need not be over $\frac{1}{8}$ in. thick; it may be stronger if required. It is evident that, if the pivots be somewhat smaller than the holes in which they work, the weather cannot affect the movement of the slats; it is also evident that the frame may be fastened together before the slats are put in, which is not the case with the common blind, and which give great facility in repairs in case of accident.

The patentee claims the method of preventing the slats from rattling, and retaining them in any position in which they may be placed, by means of the movable strip or strips pressed up by springs or other elastic substance.







The patentee says:—"This blind has been in use in railroad cars, in and about New Orleans, for over seven years, and has given universal satisfaction. In simplicity, comfort, durability, and economy, it is all that can be desired. It is applicable wherever movable or rolling slat Venitian blinds can be used. Rolling slat Venitian shutters are desirable in many situations, and there is little doubt but that many more would be used were they (as commonly made) less troublesome and unmanageable. All the objections that are made to the common rolling slat Venitian shutter, are removed by this improvement. The extra expense on each car blind does not exceed 20 cents, and on house blinds it would not exceed 80 cents for a window—a mere trifle in comparison with the comfort and durability."

For the privilege of using this improvement, apply to John Hampson, Engineer and Superintendent of the New Orleans and Carrollton Railroad.

To the Committee on Publications.

Account of the Explosion of the Steam Tow Boat Defiance.

New Orleans, June 10th, 1849.

Gentlemen,—Agreeably to your request, I forward the best information I could obtain after the receipt of your letter; at the time of the explosion, my engagements prevented me from investigating this matter, although anxious to do so.

The Defiance (belonging to the Independent Tow Boat Company) is a new boat, her engines and boilers were built by Messrs Shield & Co., Cincinnati. The boilers I suppose were made from drawings furnished by Mr. Montgomery, (who claims the plan,*) as they are similar to a pair made here for him, which were tried and condemned; I mention this as these have the same weakness, which in my opinion was the cause of the Defiance's giving way.

Coming down the river the boilers performed well, indeed they could not do otherwise, for in addition to being new, there is a large amount of fire surface; it is said that the boilers foamed much; this is reasonable, for the water is greatly subdivided.†

The external appearance of the boilers before injury, was similar to many of the so called low pressure ones. Internally, the fire acts on two arched crowns or flues, the flame passing back over a water bridge pipe (the end as shown by the dotted lines) to a chamber, *a*, and there it is diffused and circulates around 600 vertical tubes, ($1\frac{3}{4}$ inches in the clear,) before it enters the chimney; the lower ends of these tubes (a few are seen at *b*) are connected with a sheet forming the top part of a water bottom, *c;* the upper ends of the tubes are secured to a "table" or head sheet as shown in the sketch; these tubes, along with the water sides or spaces, ($3\frac{1}{2}$ inches in the clear,) forming a free communication for the circulation of the water. The attachment for the supply pipe is at *d*. The lowest of the gauge cocks, *e*, are 2½ inches above the table or head sheet, the middle ones 2½ inches higher, and the top cocks 2½ inches above the middle ones.

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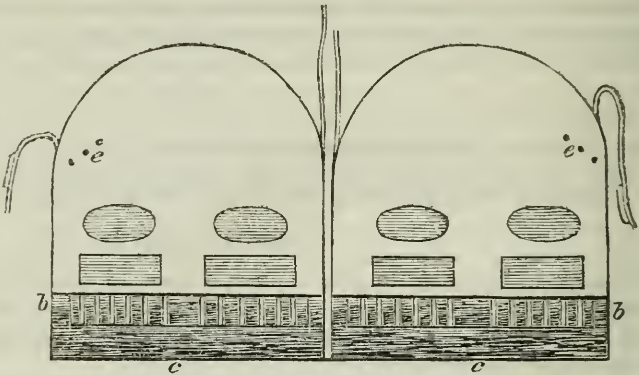
* I have in my possession a sketch, taken from a boiler, made by Mr. Holloway of your city, and put in the Thomas Jefferson, a low pressure boat, at Norfolk, Va., in 1833. The only difference is that in this boiler (Holloway's) the vertical water pipes are of larger diameter, and fewer in number, advantages that practice will lead to in this, otherwise its action was exactly similar to this patent one.

† The boilers having none but the ordinary gauge cocks, it would be very difficult to know the exact height of the water when foaming. In 1833, I had an English locomotive in my charge, which would show water at the upper cock, when there was not twenty gallons of water in the boiler; (I then devised the plan of gauge chamber, see *p.* 94, *vol.* xxi, 2d *series,* I think a republication of this would do good, as I and others have used it often since, and find it to be all that is desired; see also July number, 1841, page 14.)

The boilers were not displaced by the explosion, and, as will be seen by the diagram, they present nearly the same appearance as when viewed end on.



The Defiance started on the 24th of March, at 11 o'clock at night, with her first tow, having one ship on each side, and another astern; they ran slow through the night, on account of fog, but had increased her speed when it became clear, not long after the watch was changed, at 8 A. M.; the chief engineer (who is said to have been a very careful man) coming on duty, had tried the gauge cocks, and found the water "fair,"* and was in the act of passing from the boilers when they bursted, and he was thrown against a brace which caused an internal injury, of which he died a few hours afterwards. I suppose that the starboard boiler, (which is the one sketched,) gave away first, followed almost instantaneously by the other; the report was of a "dull sound." The force and direction of the bursting was upwards, and towards the starboard side, as part of the top of the starboard boiler, with the steam drum, etc., passed over the ship on that side; the boat having headway at the time, part of the fragments which ascended vertically, fell on the deck of the stern tow; much water in nearly a cold state fell on the deck of the Defiance. As a matter of course, all that was above the boilers, including the man at the steering wheel, were carried away; this is the seventh time of this steersman being tossed in the air, under similar circumstances, with scarcely any injury.

In this case, along with many others, an *explosive gas* has been lugged in to account for the bursting; never having been a believer in this theory, I will give something more tangible to account for the bursting. The semi-cylindrical shell being 9 feet in diameter, and only ¼ of an inch in thickness, without stays or other adjuncts, is at once seen to be too light for a working pressure ranging from 100 to 150 lbs. to the square inch; now to this first want of strength, an *unnecessarily* large hole (22 × 14 in.) is made for the man head rim, (a fragment is seen at *f*,) and another for the steam drum *g;* and to weaken the shell still more, yet another hole was cut for the safety valve (at *h*,) which would have been better on the top of the steam drum; all the holes being enclosed within the space of a few feet, it requires no fancy to suppose that the starting point of rupture was at the man hole, taking the other two holes in its course; when once ruptured, then running down the line of rivets and straightening out the sheets, as is common in explosions of this form of boiler. Part of the top of the back of the shell, like a hood, is thrown over, as is seen at *i;* a small piece of the shell of an irregular form, with the safety valve (which is of ample size) attached to it, is bent over towards the front, as seen at *k;* the blow from the casting has caused an indentation on the top of the shell. Along side of it is seen part of one of the fore and aft stays ($1\frac{1}{4}$ in. in diam.) the plate part at *l*, having been torn from the back end of the boiler.

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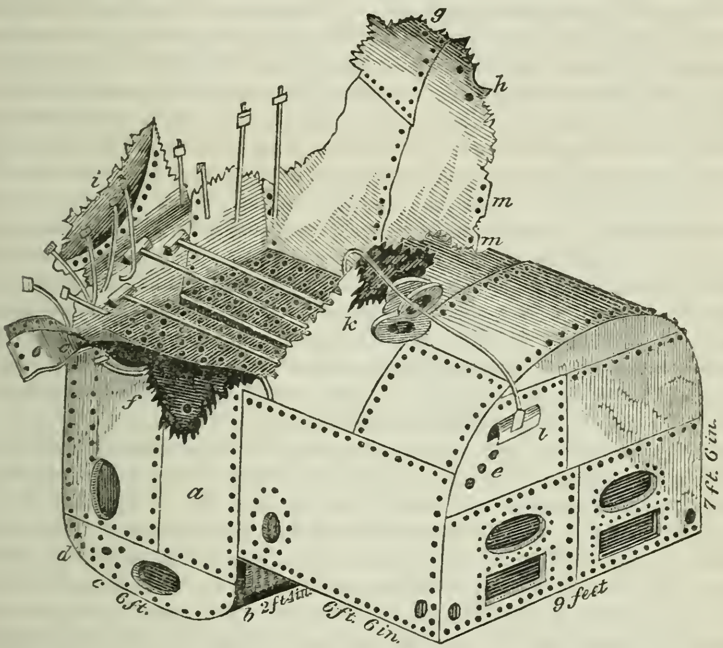
* He may have been deceived, but the want of strength of the shell, was sufficient cause in itself.



Along the lap edges of the shell, much of the iron is broken short, while a small part has the appearance of being torn; some of the match holes in each sheet, as at *m m*, are perfect, the rivets giving way without injury to the sheet. All the internal parts, with the sides, ends, and top part of the shell immediately over the arches, *(which are well stayed,)* remain uninjured.

I am not one of the advocates for making boiler plates very thick, believing that their imperfections keep pace with the thickness, but prudence and experience should have prevented the using as light iron as this.

It is not a usual practice to use stays for the shell of a boiler, as they are objectional; but I think that when the boilers are of this form, and of large size, using high steam, that ribs of angle iron passing over the top, down to each side and riveted to the sheet, would be beneficial, as, if the boiler did give way, it would prevent the large opening always made, and reduce some of the destruction consequent to an explosion.

Respectfully yours, A. C. Jones.

Mode of Extinguishing Fires in Coal Mines.

For the following interesting account of the successful result of an experiment made to extinguish a fire in the coal mine of Mr. Darlington, at Astley Collieries, near Manchester, we are indebted to the *Times*. Mr. Darlington, who is the author of the communication, writes as follows:—

"On Monday, the 2nd of April, one of my coal mines, at Astley, was discovered to be on fire, and had spread to such an alarming extent as to prevent all access by the usual shafts. We immediately put out all the fires about the works, and requested the cottagers in the neighborhood to do the same, for fear of an explosion. The plan of procedure in such cases (which happen more frequently than those unacquainted with collieries suppose) is, first to stop down all openings into the mine, so as to prevent any access of the atmosphere. If, after some time, the fire is found not extinguished, the only alternative is to fill the mine with water from some source in the neighborhood. In the absence of a sufficient reservoir of water, the pumps are stopped, and the water allowed to accumulate from the natural drainings, generally an unsatisfactory and slow process. In the former plan, notwithstanding every precaution is taken in sealing the shafts, it is found by experience that air in small quantities will be drawn through the stoppings and fissures of the earth sufficient to keep up a slow rate of combustion for a very long period. We have proof of this in many instances occurring in this neighborhood. In the extensive collieries worked by Lord Bradford, at Bolton, the mine has been on fire nearly two years. When the fire happened, it was sealed up for some months; but, on opening it, the fire was found still burning. The pits were again immediately sealed up, and left to remain for twice the former period. On opening the mine at this time the fire burst out as before. It was again closed, and so remains to this day. At the collieries of the Earl of Ellesmere, at Worsley, one of the mines took fire about the same time; it was treated in the same way; it is still on fire; and, at this moment, his lordship is about to turn in the Bridgewater Canal. In the Patricroft Colliery, the deepest mine in this county, a fire broke out in the upper part of the workings, which baffled every attempt to extinguish it, and is now stopped up and abandoned. At Mr. Blundell's colliery, at Blackrod, in this district, the pits were opened after being closed some weeks, on account of fire, when a fearful explosion took place, and did considerable mischief to the workings. The fire burned with greater intensity than ever: the flames rose out of the mines, set fire to the head-gear, and burned so fiercely within the pit that it actually melted the iron tram-wheels. In this case the River Douglas was eventually turned into the workings so as to fill them with water. I could mention several other cases in this immediate neighborhood, to show the importance of the question before us, and the difficulties we have to contend with when these unfortunate accidents occur. In our case we instantly sealed up the mine, yet fire-damp issued from every crevice about the stoppings, and through orifices in the earth, in such quantities that the safety lamps would take fire at a considerable distance. In this state of things I wrote to Mr. Goldsworthy Gurney, (whose application of high-pressure steam to the ventilation of coal mines is exciting so much interest,) stating the case, and asking if he could point out any plan, by high-pressure steam exhaustion, or otherwise, likely to be of service. Mr. Gurney immediately came down, and after well investigating the conditions, in consultation with us, proposed to fill the mine with carbonic acid, azote, or some other extinguishing and incombustable gas. This, at first, appeared to us impracticable,—the immense quantity required to fill the galleries and lateral workings, together above three miles in length, being too expensive, if it were possible to obtain it, to warrant the proposition. He, however, soon set us right. He said nitrogen, or azote, might be obtained from the winds of Heaven, and carbonic acid from the coals lying waste about the pit, assisted by a little charcoal and lime; air would be deprived of its oxygen by being passed through burning charcoal, coal, coke, and small coal, and the azote set free. In short, the product of this combustion would be the choke, or black damp known in mines. We immediately built a furnace of brickwork four feet square, at a safe distance from the downcast shaft. To the ashpit, in every other respect made tight, an iron cylinder thirteen inches in diameter was connected, and made to terminate at an elbow under water in a close tank partly filled. With the upper part of this tank, above water, another pipe was connected and carried through the stopping of the downcast pit. A powerful steam jet was made to work between the furnace and the tank, which drew the air down through the fire, and forced it through the water. A second jet was placed in the cylinder at the top of the down cast shaft, and made to draw the choke-damp from the tank, and force it into the pit. At the other, or upcast shaft, we placed a jet in a cylinder, communicating, through the stopping, with the mine, for the purpose of exhausting the shaft beneath and thereby assisting the compressing jets to drive the choke-damp through the galleries. The apparatus thus fitted, as soon as the fire in the furnace had burned up, was set in action. In order to test the effect of the choke-damp, we placed some burning tow, moistened with spirits of turpentine, into it. The flame was as instantly extinguished as if it had been placed in water. It was thus tested in the cylinder, as it passed from the ash-pit, before coming to the jet, and also in the tank and second cylinder, with similar results. This was conclusive evidence of the perfect formation of the choke-damp. In about two hours after the jets were set in action, fire-damp disappeared from the shafts, and we observed a slight cloudy appearance in the escapage from the upcast shaft. It had the sulphurous smell of choke-damp, which pervaded the air to a considerable distance. A safety lamp was now brought and placed in the upcast cylinder; it became instantly extinguished as if put into water. For this purpose the draughts were momentarily shut off. A bright burning fire of charcoal, in a chafing dish, was placed in the escapage at the cylinder, and was also immediately extinguished. These facts satisfied us that the choke-damp had passed through the mine. The period of its appearance agreed with our calculations. The quantity of choke-damp forced through the mine was about 6000 cubic feet per minute, and this would fill the galleries in about that time. The choke-damp was allowed to remain for several hours, at the termination of which we were convinced that all fire, however intense, must be extinguished in the mine. The connexion with the furnace was now broken, and fresh air driven through by the same jets. In about two hours the choke-damp disappeared; this was shown by a safety lamp burning clearly in the escapage in the cylinder at the upcast shaft. We regarded the mine now as perfectly safe. With several men I descended the downcast shaft, 390 feet deep, to the tunnel leading to the working. We found all clear: the exhausting jet was kept up, drawing fresh air through the mine all night. The next day several men went down, and passed through the workings, and found all clear and safe. Their report was particularly favorable. In no part of the mine could they perceive any fire, and the action of the single jet in the upcast is described by them as passing a current with greater speed than the furnace (which is pronounced to be the most effectual one in the county) had ever before done in this or any other of the mines of which I am the proprietor. This result has occasioned the greatest interest in our neighborhood. Never was an experiment more successful. A gigantic power under such complete control, fighting with the elements, and, as it were, compelling them to destroy each other. The application of high-pressure steam to the ventilation of coal mines may effect a greater protection to life and property, but we regard this application as little inferior to the coal trade, and a triumph of science equal to any of the present day. Lon. Jour. Arts. June, 1849.

Translated for the Journal of the Franklin Institute.

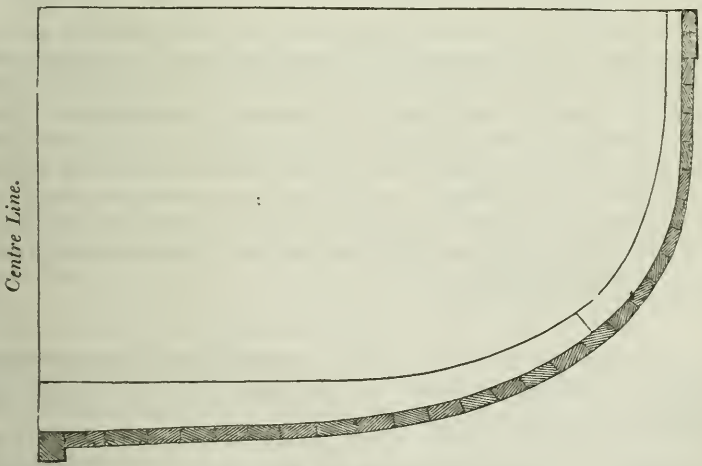
Electricity of the Human Frame.

At a meeting of the Academy of Sciences of Paris, 21st May, 1849, M. de Humboldt sent an extract of a letter in which M. Emile du Boys-Reymond describes summarily an experiment which consists in causing the deviation of the needle of a galvanometer, by the effect of muscular action. The following passages are from this letter:—"I take a very sensitive galvanometer; I fix at its two extremities, two slips of perfectly homogeneous platina; I plunge these two slips into two vessels filled with salt water, and I then introduce into these same vessels two corresponding fingers of my two hands. At the first immersion of the fingers a more or less decided deviation of the needle is always produced, the direction of which follows no law, and which is probably due at least in part to some heterogeneousness of the skin of the fingers. When there is a wound on one of the fingers, the deviation is stronger, and always directed in such a way as to shew that the wounded finger behaves as the zinc of a zinc-copper couple, supposed to be between the vessels in place of the body. Of course this is not the kind of action which we are concerned with now; on the contrary, in order to observe the effects announced, we must wait, either until the needle has returned to the zero of the scale, or until it has taken a steady position under the control of the remainder of a current which cannot be overcome. When this moment has come, I strain all the muscles of one of my arms so as to establish an equilibrium between the flexors and extensors of all the joints of the arm. At once the needle moves, and the direction of the movement is such as to indicate in the stiffened arm an inverse current, according to the notation of Nobili, that is a current directed from the hand to the shoulder. This arm behaves therefore as would the copper of the zinc-copper couple before alluded to. When I make the experiment with my galvanometer the deviation amounts to 30°. I can however obtain much more extensive movements of the needle, by contracting the muscles of the two arms, alternatively in time, with the oscillations of the needle. The amount of the deviation, all other things being equal, depends much upon the degree of development and exercise of the muscles."

M. de Humboldt adds, in a letter addressed to M. Arago, dated 17th May:—"The experiment, the effect of the human will, alternately stiffening the muscles of the two arms, leaves not the shadow of a doubt. Despite my great age, and the little force I have in my arms, the deviations of the needle were very strong. They were naturally still stronger, with M. Jean Muller, our great anatomist, and with M. Helmkoltz, author of some important physiological books, who accompanied me the day before yesterday to visit M. Emile du Boys. The experiment may be facilitated by immersing the index finger of each hand in the water, and supporting the palms of the hands so as to stiffen well the muscles of the arm which is to act." L' Institut. 23rd May, 1849.

Particulars of the Steamboat Joseph Belknap, recently built in New York, and running on the Hudson River from New York to West Point.

Length on deck, 187 feet; breadth outside of plank, 27 feet 4 inches; depth of hold, 8 feet; draft of water, 4 feet; plank of yellow pine, 2½ in. thick; floor timbers 13 in. deep, 4½ in. thick, and 28 in. from centre to centre. The dead flat, or midship section of the hull, is equidistant from stem and stern post, but the centre of gravity of the hull is 17 inches aft the midship section, caused by an overhanging transom stern.



Midship Section.

Diameter of cylinder, 3 ft. 4 in.; length of stroke, 12 ft.; diameter of water wheel, 28 ft. 10 in.; face of paddles, 8 ft.; number of paddles in each wheel, 28; depth of paddles, 2 ft. 2 in.; the paddles dip under 4 in.; average number of revolutions, 24 per minute; average pressure of steam, 45 lbs., using Stevens' cut-off, and admitting steam 6 ft. 6 in. of the stroke. Best speed, 20 miles per hour. She has two boilers, 28 feet long, 6 feet 6 inches diameter of shell, and fronts of the same width; two furnaces in each boiler, 34 inches wide and 7 feet long, with rising flues and single return; a steam chimney on each boiler, 32 inches inside diameter, 8 feet 6 inches high, with a steam space of 8 inches outside. The consumption of anthracite coal is 2000 lbs. per hour; the boilers are supplied with air for combustion from two blowers, 54 inches in diameter, and 24 inches wide, which discharge into an air-tight fire room, and from thence to the ash pit, and are capable of making 70 lbs. of steam for 10 hours, the engine cutting off at 6½ feet.

This boat may be considered a superior specimen of work, whether we examine the machinery or the hull. The former was built by Messrs. H. R. Dunham & Co., of the Archimedes Works, in New York, and the boat is named after their engineer, Mr. Belknap. The hull was built by Colyer, the same that built the "America;" his models are well known for speed.

B.

Translated for the Journal of the Franklin Institute.

On the Method by which the Phosphate and Carbonate of Lime is introduced into the Organs of Plants.

M. J. L. Lassaigne, at the meeting of the Academy of Sciences of Paris, of the 15th January, presented a memoir upon this subject, showing by experiments that the phosphate and carbonate of lime are introduced into plants in solution in water containing carbonic acid, which had before been shown as to the phosphate by M. Dumas, and has long been known as to the carbonate.

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We note this memoir for the purpose of saying that the first person, to our knowledge, who endeavored to call public attention to the important agency of carbonic acid dissolved in water in procuring food for plants, from otherwise insoluble salts, was the late Mr. Charles Roberts, of this city, who in the year 1839, suggested the experiments made in the laboratory of Prof. Booth, in which it was shown that the green sand of New Jersey (silicate of potassa and protoxide of iron) was thus dissolved. Oxalic acid was also shown to be an excellent solvent for this usually refractory substance, which rarely yields entirely even to nitro-muriatic acid, except by a prolonged digestion.

F.

On the Explosion of Fire-damp which occurred in the Eaglesbush or Eskyn Colliery, Neath, South Wales, on the 29*th of March,* 1848. *By* Joshua Richardson. *M. Inst. C. E.*

This paper first detailed the frequency of these occurrences in some parts of South Wales, and more particularly in this colliery, where the tender and friable nature of the coal peculiarly induced in the working, or excavation, the formation of fire-damp and explosive gas. This had been shown experimentally, by Sir Humphrey Davy, when, on breaking up large coal under water, he collected a quantity of fire-damp at the surface.

It then gave a description of the colliery workings; the state of the mine before the explosion occurred; the condition in which it was found at the time of the inspection—a fortnight after the accident; the probable causes of the catastrophe, and the best known means of preventing a recurrence of such events.

The seam of coal was described as being about four feet in thickness, of a highly bituminous and friable nature, and worked by an inclined adit, or entrance, with a main gallery, whence the stalls were worked on either side—horses being employed to draw out the coal in trams, which were conveyed direct to the vessels in which it was shipped for exportation to the extent of thirty thousand tons annually. The ventilation was effected by a down-cast and an up-cast shaft, between which an air course was arranged so as to extend throughout the active workings, with a chimney at the exit, through which the air should have been expedited by a furnace, which, however, had been rarely lighted; and the air course, which was one mile and five furlongs in length, was in places of unequal and inadequate areas, so that, in certain states of external atmosphere, the air in the mine became very sluggish, and even at times oscillated to and fro instead of regularly traveling onwards in an uninterrupted current. This was so much the case, that the colliers employed fans to drive the gas from them into the proper channels. Great negligence appeared to have existed, both in the general system of working, and in the use of the Davy lamps, which were frequently used without the wire gauze guards.

The usual state of the mine could not be judged of by an inspection *after* an accident, as all the falls and incumbrances had been removed, the destroyed door and stoppings had been well replaced, and general precautions had been adopted, which evidently had not previously existed; but there still remained evidences of want of precautionary measures. Candles and open lamps had been constantly used, although the general fiery character of the mine was notorious; and, after the explosion, two Davy lamps were found without their wire gauze guards.

The temperature in various parts of the mine was so near that of the external atmosphere, that it was evident spontaneous ventilation could not have proceeded regularly; and it was shown that the slightest change of the density of the air, even from the sun breaking out, would have sufficed to render stagnant the whole system of ventilation; especially as the furnace, which should have accelerated the current by exhaustion, had been allowed to fall into a ruinous condition, and had seldom been used, and the velocity of the current had rarely exceeded five feet per second, which was totally inadequate to supply the requisite quantity of air for such an extent of workings.

The cause of the accident was therefore very apparent, and might be attributed to a want of general good system of ventilation, permitting accumulations of gas and fire-damp, and the careless use of open lights, or unserviceable Davy lamps; and the consequence of this was the sudden death of twenty men, and several horses, with great injury to the mine.

The means of prevention were, evidently, a complete revision of the system of ventilation—the enlarging of the air course to uniform and adequate dimensions—the proper division of the air into several columns—the construction of proper doors and stoppings in convenient positions—strict regulations for the use of Davy lamps, or other means of lighting, and better general superintendence, by educated men, who would enforce precautionary measures.

Due credit was given to the proprietors for their anxiety to afford every means of inspection, and for adopting all suggestions calculated to prevent the recurrence of such an event; and it was stated that they had since erected one of Mr. Price Struve's ventilating apparatus, of the working of which an account was promised in a future communication.

In the discussion which ensued, the various systems of working and of ventilation, in all parts of England, were noticed; and it was shown that, in general, every means was adopted to prevent accidents; but that up to the present time, the mines in the West were not as well managed as those in the North, or the midland district. Every day, however, introduced better measures and better men, of education, for carrying into effect the most approved systems, and that, as the mines became more extensively worked, so these accidents would and did become less frequent. —*Proc. Insti. Civ. Engineers.* Prac. Mech. Jour. April, 1849.

Translated for the Journal of the Franklin Institute.

Use of Colored Glasses to Assist the View in Fogs.

The following curious observation is made by M. Luvini, of Turin, in a letter to the editor of *L'Institut*, at Paris. If it be verified, it may prove to be of importance to geodetical operations, as well as in observations at sea.

"When there is a fog between two corresponding stations, so that the one station can with difficulty be seen from the other, if the observer passes a colored glass between his eye and the eye-piece of his telescope, the effect of the fog is very sensibly diminished, so that frequently the signals from the other station can be very plainly perceived, when, without the colored glass, the station itself could not be seen. The different colors do not all produce this effect in the same degree. The red seems the most proper for the experiment. Those who have good sight prefer the dark red, those who are short-sighted like light red better. The explanation of this effect seem to depend upon the fact that the white color of the fog strikes too powerfully upon the organ of sight, especially if the glass have a somewhat large field. On the contrary, by placing a colored glass between the eye of the observer and the eye-glass of the instrument, the intensity of the light is much diminished by the interception of a part of the rays; the observer's eye is less wearied, suffers less, and consequently distinguishes better the outlines of the object observed."

L'Institut, Jan. 4, 1849.

New Material for Printing Types.

On Saturday last, (May 26,) a new invention, which is called the apyrotype machine, was submitted for inspection at a meeting of the Royal

Society, and elicited the highest approbation of many of the most eminent members of that body; it is also now in course of private exhibition in Bartlett's buildings, Holborn, with a view of bringing it under the notice of practical men, in order to promote its introduction into actual operation. The object of this invention is, by means of self-acting machinery, to manufacture printing type not liable to the fragility, softness, and rapid deterioration—the much-complained of defects of the type at present in use.—These defects arise from the use of an alloy fusible at a low temperature; the metal possessed of that property being destitute of the degree of hardness requisite for producing those numberless impressions of the "broad sheet" which have now become one of the prime wants of modern civilization. This desideratum is secured by the use of hard metals—such as zinc, copper, and even iron; and, instead of fusing the metal, and pouring it into moulds, to give it the required form, the type is manufactured by a mechanical operation at ordinary temperatures, chiefly by means of powerful pressure and the use of steel dies. The exact durability of the article thus manufactured has yet to be ascertained by experiment; but the superiority of copper, even in its ordinary and uncompressed state, is estimated by practical persons to exceed the material now commonly used in the proportion of 100 to 1. This invention, the credit of which is due to a Frenchman, named M. Petit, who has labored unremittingly for the last seven years to bring it to its present degree of maturity, is regarded by many as destined ultimately to constitute quite a new era in the art of typography. Lond. Min. Journ., June, 1849.

Account of a Binocular Camera, and of a Method of obtaining Drawings of Full Length or Colossal Statues, and of Living Bodies, which can be Exhibited as solids by the Stereoscope. By SIR DAVID BREWSTER, F. R. S.

In this paper the author pointed out the changes which take place in the visual representation of bodies of three dimensions, such as statues, buildings, and living bodies, when they are viewed at different distances by one or both eyes, or when reduced copies of statues are viewed in a similar manner. He showed that full length and colossal statues, as works of art, are not so perfectly seen as reduced copies of them, and that there is *cæteris paribus* a certain ratio between the distance of the eyes and the magnitude of a body of three dimensions, when its visual form is best developed. The author then described a Binocular Camera, and explained a method of obtaining by its means such dissimilar drawings on a plane of full length, and colossal statues and living bodies, as will give the best representations of them in relief when united by the stereoscope. The Binocular Camera described by the author is composed of two semi-lenses, obtained by bisecting an achromatic lens. These semi-lenses are placed at the distance of the two eyes, or at such multiples of that distance as may be necessary to take dissimilar drawings of full-sized or colossal statues, for the purpose of reproducing the statue in the stereoscope. The author described and explained a method by which statues of all sizes, and living bodies, may be reproduced, as it were, and exhibited in three dimensions: and he pointed out the great advantage which the sculptor would derive from the possession of dissimilar drawings of works of art, and from the study of them when viewed in their true relief in the stereoscope: A Microscopic Stereoscope, with several curious diagrams, was exhibited, and, in particular, the effect of dissimilar drawings, made by the Binocular Camera, of Danneker's statue of Ariadne on the Leopard, when united in the stereoscope. The united image stood out in high relief as in the original statue.—*Proc. Royal Scottish Soc. Arts.*

Civ. Eng. and Arch. Journ., June 1849.

Translated for the Journal of the Franklin Institute.

Method for the Carbonization of Organic Matters, for the Detection of Minute Quantities of Arsenic. By M. Filhol.

In an excellent and elaborate article upon arsenic, M. Filhol proposes the following modification of Orfila's process for carbonizing organic substances which are suspected to contain it in minute quantities. The object of this modification is to avoid the rapid ignition of the carbon which frequently takes place at the end of the operation, and by which much of the material is frequently lost. To prevent this, M. Filhol proposes the addition of a small quantity of sulphuric acid, (12 or 15 drops for 100 grammes of nitric acid,) to the nitric acid, and directs the process to be conducted as if with the pure nitric acid. The combustion of the carbon will thus be rendered impossible, as it will remain moistened with sulphuric acid, owing to the volatility of this substance, after the whole of the nitric acid has been evaporated. M. Filhol states that the results given by this process are as good as those of the more tedious method proposed by MM. Flandin and Danger. Journ. de Pharmacie et Chemie, Dec. 1848.

From the London Mechanics' Magazine for March, 1849.

Strength of Glass Pipes—Experiments by Chas. Thornton Coathupe.

In consequence of the perusal of the editorial remarks as to the probable "why or wherefore" glass pipes were not substituted for pipes of lead at Claremont, I gave directions to the chief mechanic at our works to prepare hydraulic apparatus for testing the strength of glass pipes—such as are ordinarily made at the Nailsea Glass Works.

All the pipes submitted to trial were cut to three feet in length. Their internal diameters varied from $1\frac{1}{8}$ inches to $2\frac{3}{4}$ inches. The various thicknesses ranged from $\frac{1}{11}$th to $\frac{3}{16}$ths of an inch. In every instance each pipe sustained an internal pressure of 672 lbs. per sq. inch. In two instances only did any pipe burst with a less pressure than 784 lbs. per sq. inch. In all the other trials every tube was removed, unbroken, under a pressure of 1568 lbs. per sq. inch. To you I offer the first rough statement that has yet appeared on this interesting subject. I need not inform you that a series of experiments are in progress, which, when complete, may possibly prove somewhat astounding "to engineers and others," whose duty we have hitherto considered it to be, to experiment for themselves, upon captivating novelties touching their own art.

The more minute, as well as the more extended matters of interest, must be reserved for a future communication.

FRANKLIN INSTITUTE.

Proceedings of the Stated Monthly Meeting, July 19*th*, 1849.

Thomas Fletcher, Vice President, in the chair.

Isaac B. Garrigues, Recording Secretary.

The minutes of the last meeting were read and approved.

Donations to the Library were received from—The Royal Geographical Society, London; Prof. A. D. Bache, Washington City, D. C.; Asbury Dickens, Esq., Secretary U. S. Senate; Lieut. T. A. Jenkins, U. S. Navy; Prof. M. H. Boyè, Prof. J. C. Booth, Messrs. Joseph Cresson, and M. A. Root, Philadelphia.

Donations to the Cabinet of Minerals were received from William Bakewell, Esq., of Pittsburg, Penn., and Theodore F. Moss, Esq., of Philadelphia.

The Treasurer's monthly statement of the receipts and payments was read.

The Board of Managers and Standing Committees reported their minutes.

New candidates for membership in the Institute were proposed, and those proposed at the last meeting were elected.

COMMITTEE ON SCIENCE AND THE ARTS.

Report on the Catoptric, Dioptric, and Catadioptric Systems of Lights for Lighthouses.

Continued from page 68.

Appendix containing the Notes referred to in the Report.

Note 1. Communication from Messrs. E. & G. W. Blunt, of New York; 25th Congress, 2d session; documents 258 and 738.

Report from I. W. P. Lewis, Civil Engineer, upon the condition of the lighthouses, beacons, buoys, and navigation, upon the coasts of Maine, New Hampshire, and Massachusetts; 27th Congress, 3d session; document 183, H. Rep.

Extracts from a Report upon the Dioptric Light, addressed to the Secretary of the Treasury, by I. W. P. Lewis, *Civil Engineer, April* 23, 1845.

"One of the most remarkable defects in the fitting up of our lighthouses is the diminutive size of the reflectors, which, for the most part, are only 14 inches in diameter; the burners are uniformly three-fourths of an inch in diameter. Now these same burners would illuminate a reflector of 25 inches diameter just as perfectly as they do the reflector of 14 inches diameter, and the gain of light, without any increase in the consumption of oil, would be thus:—

Taking the magnifying power of a 25-inch reflector at	327 burners,
Then, by proportion, the 14-inch reflector has a magnifying power of - - - - - -	103 burners,
Loss of light by use of small reflector -	224 burners.

In other words, we lose two-thirds of the light generated in our burners, by using small reflectors instead of large ones. We may use any other figures to represent the relative power of the two sizes of reflectors above named, but the proportion will remain the same. In France, reflectors of 36 inches diameter were formerly in use, and the standard sizes adopted in Great Britain for the last 35 years has been 25 inches for revolving lights, and 21 inches for fixed lights."

"By the U. S. Catalogue of 1842, the various sizes of reflectors then in use at 242 lighthouses were—

Of 9 inches diameter at	21 stations.
14 " "	127 "
15 " "	46 "
16 " "	17 "
18 " "	2 "
21 " "	10 "
Size not stated, but supposed to be 14 in.	19 "
	242

"In every fixed light, the number of lamps and reflectors should correspond to the extent of horizon to be lighted. Each parabolic reflector has an effective divergence of not more than 15° in azimuth; consequently a light located on a rock in the sea, like Boon Island or Mount Desert, should have 24 reflectors, because these lights are required to illuminate a navigable horizon of 360 degrees, and because $15 \times 24 = 360$. But Boon Island has only 12 reflectors, or half the number it should have, and Mount Desert has only 10 reflectors. In the first, each reflector is expected to cover a sector of 30 degrees in azimuth, while the latter must be supposed to cover 36 degrees of azimuth by each reflector, in order to render its light visible from all parts of the horizon. This extraordinary deficiency in the proper number of lamps and reflectors is common to all the fixed lights on our coast, and there is one case where there are but 7 reflectors for the entire circle of the horizon, which implies an effective divergence of $51\frac{3}{7}$ degrees for each reflector. The 28 exterior fixed lights in the annexed catalogue are illuminated with 276 lamps. According to the sea horizon which each of these is *supposed* to illuminate, there should be 503 lamps, allowing the effective divergence of a reflector to be 15 degrees. Mr. Alan Stevenson only allows 11 degrees of divergence, and states that, if more than this is permitted, the lights will be visibly weaker in the points intermediate between any two adjacent reflectors. At a distance of 10 miles, many of our fixed lights are hardly visible from the cause above stated, and in hazy weather it would be physically impossible for any one to see either of the two lights above named, from a point intermediate between the axes of any two reflectors, at even one-half that distance."

"It is evident, from the foregoing statement, that, in order to make our fixed lights as equally brilliant in all azimuths as they now appear only in particular directions, it will be necessary to double the number of lamps and reflectors, and consequently the consumption of oil. * * * In the Dioptric system of fixed lights, we have the very reverse of all this. The economy for each order respectively is greatest when it is required to illuminate the entire horizon of 360 degrees; because, to increase its range of usefulness, we do not add lamps, but only lenses."

"The following table shows the illuminating power of the combined effects of 10 parabolic reflectors of 25 inches diameter, representing one face of a revolving light of 3 faces, or 30 lamps in all. This is compared with a lens light of the 1st order revolving, and having 8 faces, each one being equal in illuminating power to 10 reflectors of 25 inches diameter. The reflecting light illuminates only 3 points of the horizon in its rotations, and consumes 1440 gallons of oil per annum, while the lens light illuminates 8 points of the horizon in its rotations, and consumes but 600 gallons of oil per annum."

"The lenses make their revolutions in 21 minutes and 20 seconds, and the reflectors in 8 minutes. The beam of light from each system, therefore, occupies equal times in passing the eye of the observer, the reflectors having 15 degrees of divergence, while the lenses have but 6 degrees of divergence. The illuminating power of each is expressed in Argand burners, and the table is quoted from the experiments of W. H. Barlow, Esq., C. E., who investigated the subject by command of the Sultan of Turkey.

Seconds of time.	Single reflector with Argand inch burner.	Ten reflectors with Argand inch burners.	French Lens. 4-wick burners.
1	0·0285	0·285	?
2	0·0617	0·617	?
3	0·1019	1·019	10·4
4	0·1501	1·501	10·4
5	0·2133	2·133	10·4
6	0·2937	2·937	10·4
7	0·4019	4·019	10·4
8	0·5555	5·555	10·4
9	0·7905	7·905	10·4
10	1·0000	10·000	10·4
11	1·0000	10·000	10·4
12	1·0000	10·000	10·4
13	1·0000	10·000	10·4
14	1·0000	10·000	10·4
15	1·0000	10·000	10·4
16	1·0000	10·000	10·4
17	0·7905	7·905	10·4
18	0·5555	5·555	?
19	0·4019	4·019	?
20	0·2937	2·937	Dark.
21	0·2133	2·133	"
22	0·1501	1·501	"
23	0·1019	1·019	"
24	0·0617	0·617	"
25	0·0285	0·285	"
26	Dark.	Dark.	"

These figures illustrate the peculiarities of the reflector and the lens. The reflector does not attain the maximum of its power until the 10th second of time in its rotations, and retains this power only for 7 seconds, while the lens reaches its maximum effect in the 3d second of time, and retains it for 15 seconds. The gradual increase for each second of time in the illuminating power of the reflector, until it reaches its maximum, the short duration of its maximum, and rapid decrease to minimum power, prove the important fact that this instrument has not sufficient effective divergence to be used advantageously for fixed lights in comparison with dioptric lights, whose peculiar value consists in a perfectly equal distribution of light to all azimuths—an effect not attainable with reflectors."

"In the foregoing tables, the duration of the highest periods is as 14 to 6: that is to say, the number of degrees of the horizon illuminated with the brightest light, by the eight faces of a system of lenses, is to the brightest light by the three sides of a reflector frame as 14 to 6. Consequently we should require seven sides to our reflector frame, to be equal in this respect to the lenses, and as each side must have ten reflectors to be equal in power to one face of the lens system, we should require to consume the oil of 70 Argand lamps to produce the same effect with the present construction of our reflectors, as that which is obtained with lenses with the consumption of 13 Argand lamps, viz:

70 lamps at 48 gallons per year is - -	3360
13 " " " - -	624
Excess - - -	2736

Extract from the reply of CAPT. W. H. SWIFT, *Top. Eng., to the interrogatories addressed to him on the 14th April,* 1842, *by the Commissioners appointed to investigate the affairs of the New York Custom House; being his answers to the first six questions.*

1. I am a captain in the corps of topographical engineers, and my present station is Springfield, Massachusetts.

2. I am somewhat familiar with the appearance of the lights in Long Island Sound. I have been in the habit of passing and re-passing them several times during the year, for 20 years past. With those on other parts of the coast I am less familiar, but have seen many of them.

3. I have noticed the appearance of a number of the lights on the western coast of England, and the eastern coast of Ireland—for example, the Holyhead, Skerries, Tuskar, Mouth of Wyre, and others in the Irish Sea. I have not noticed any of the lights upon the coast of France.

4. I have never *seen* upon our coast a light which approached, in a remote degree even, the brilliancy exhibited by the English lights, which I have referred to above. It is proper that, at the same time, I should state that I have not yet seen the lights at Neversink, fitted with the lenticular apparatus of Fresnel; nor have I seen the lights at Boston and Stonington, fitted with the English illuminating apparatus. I can perceive no reason why these three lights should not be equal in brilliancy to those of the same class in England and France.

5. The great difference in the appearance between our lights and those of England is ascribable, I conclude, entirely to the superior character of the illuminating apparatus adopted in England. In that country, reflectors of proper form and of great size (from 21 to 28 inches in diameter) are in use; while with us, as I perceive by a statement of the Fifth Auditor, of December 1, 1839, the reflectors in our lights vary from 9 to 16 inches diameter, three lights only being furnished with reflectors of 18 inches.—Not only the size but the shape of the reflector affects materially the quantity of light furnished by a given lamp, as may be readily supposed. I

cannot state from personal knowledge whether sufficient attention has been given to the shape and reflecting surface of the reflectors; but, judging from information which I have received, and from the report of the naval offices appointed to examine the lighthouses in 1838, (Document 24, H. R., December 13, 1838,) I should infer that, in this respect, this important matter had not received sufficient attention.

The French apparatus (Fresnel's) is again superior to the English. Both are immeasurably superior to our own, as all may perceive who will read the descriptions of the several systems adopted by each country.

6. The reply to question 5 furnishes an answer to the greater part of No. 6. The *principle* of the illuminating apparatus is claimed to be similar to that of the English, but the immense superiority of the lights of the latter, in point of brilliancy, would seem to disprove the statement. I repeat, that such of the English lights as I have seen far exceed in brilliancy those of our own coast, with the appearance of which I have stated myself to be familiar.

Letter from the Secretary of the Treasury of the United States, with Reports and Documents; 25th Congress, 3d session, H. R. Doc. 24.

Report of Mr. Davis; 6th Congress, 1st session, S. Doc. 474.

Report of the Secretary of the Treasury of the United States, on the Improvements in the Lighthouse System, and embracing Report from Lieut. T. A. Jenkins, U. S. N., and Lieut. R. Bache, U. S. N.; 29th Congress, 1st session, Doc. 488.

Extract from the preceding Report.

"Without referring further in this connexion, to the European lights, and the boards under which they are placed, we will proceed to remark briefly upon those of our own country, and of the manner in which they are controlled and superintended. We have visited some of the lights in the vicinity of New York, in Chesapeake bay, and at the capes of Virginia and Delaware, &c.; besides which, we have seen many of the lights on the coasts of Maine and Massachusetts, in Long Island sound, and Chesapeake bay. These visits and observations have enabled us to draw, as we believe, a fair and just comparison between the lights on our coasts and those of other countries; and we feel constrained, although with deep regret, to state that ours are far inferior to any and all we saw during our visit to Europe. This inferiority is strongly marked in the towers, buildings, lanterns and their fixtures, in the illuminating apparatus, and, in general, in the attendance upon, and supervision of, the lights. The lamps are of decidedly bad construction; the reflectors, with a single exception, of an inferior description; and both lamps and reflectors so badly attached to their frames that it would be almost impossible to keep them in perfect adjustment: as it is, very few of them *even approximate* to it.

"From the manner in which the keepers are permitted to enter upon their duties—taking charge of lights without any previous knowledge of, or instruction in, the duties of such an establishment—it is not so surprising that many of them are in bad condition, and not properly attended to."

The Documents published by Congress, relating to Lighthouses, some of which are referred to in these Reports, may also be consulted.

NOTE 2. Annaire pour l'an 1831, presente au Roi, par le Bureau des Longitudes; Notices Scientifiques, par M. Arago.

Stevenson's Notes on the Illumination of Lighthouses, 1848, quarto, London and Edinburgh.

Report of Select Committee of the House of Commons of Great Britain, upon Lighthouses; 1 vol. folio, London, 1845. Evidence of Alan Stevenson.

See remarks of William Herschell on the reflection of light from surfaces of *speculum* metal, in the Philosophical Transactions, Vol. 90, page 64, London.

(To be Continued.)

Report on R. E. Monaghan's Apparatus for Recording the Ayes and Nays in Legislative Assemblies.

The Committee on Science and the Arts, constituted by the Franklin Institute of the State of Pennsylvania, for the Promotion of the Mechanic Arts, to whom was referred for examination—"A method of recording the Ayes and Nays in Legislative Assemblies," invented by Mr. R. E. Monaghan of West Chester, Pennsylvania.—REPORT:—

That the method of Mr. Monaghen consists in an arrangement of wires similar to that used in hanging our common house bells. Two such wires lead from the desk of each member to the desk of the Clerk, where each one is attached to a lever, the free end of which carries a cutting edge or point.

Upon a suitable frame under the levers are placed lists of the members of the house, as many in number as it is desired to have copies of the record; and the levers are so arranged that the points of those attached to each desk are placed, the one before, the other after the name, and the columns in which the marks from these points come, are headed, the one ayes, and the other nays.

The member votes by pulling either one or the other of the wires attached to his desk, which are labelled aye and nay, and by so doing he immediately records his vote as many times as there are lists of members placed under the points. The marks are very distinct, and the time occupied in the voting is reduced to that necessary for the Clerk of the House to read the names and sum up the votes of the two columns.

It is not within the proper powers of this Committee to decide upon any of the advantages to be derived from this method of rapidly taking the ayes and nays, except that arising from the great economy of time. The others, such as rendering the voting of members more independent, and preventing the resort to the calling of the ayes and nays, as a mere means of delay and vexation, being in their nature political. The Committee therefore confine themselves to the expression of the opinion that the apparatus of Mr. Monaghan fulfils the purpose for which it was intended, by making any number of instantaneous records of the votes. Mr. Monaghen has submitted to the Committee numerous certificates from the members and Clerks of the House of Assembly at Harrisburg, where his apparatus has been erected, that its results were satisfactory.

The apparatus is very simple, not expensive, and easily repaired by an ordinary mechanic, and so far as the Committee know, they have reason to believe is novel. They therefore judge it worthy of approval.

By order of the Committee,

William Hamilton, *Actuary.*

Philadelphia, July 12th, 1849.

BIBLIOGRAPHICAL NOTICES.

Chemical Analysis, Qualitative and Quantitative. By Henry M. Noad. *With numerous additions, by* Campbell Morfit. *With Illustrations, pp.* 572. *Philadelphia, Lindsay & Blakiston.* 1849.

The visible objects around us are not as simple as they appear to be, but with few exceptions are variously compounded of two or more simple or elementary bodies, that is, simple, undecomposable, not resolvable into other bodies, according to the present state of our knowledge; and we have nothing to do with the conjectures as to what future chemists may accomplish. It is the business of the chemist to resolve these compounds into their elements, to show us of which elements and in what proportion they are composed. Now there are 63 elements, of which 20 are in constant use among us, 14 employed to a considerable extent, 7 of trifling importance, and 22 not used at all, as far as we know. Since the properties of a compound are usually very different from those of its constituents, we cannot know by simple inspection what a body is composed of, and to determine its composition is not always, indeed rarely, an easy process.—We must know the properties of each body, the manner in which it behaves to various chemical agents, and by taking advantage of those properties or behavior, in which two elements differ, we may separate them from each other. But these differences are often so slight that the difficulties of separation are by no means as easy as might be imagined. Fortunately most of the bodies we have to deal with contain but few elements, for if we had to decompose a compound containing some 30 of the elements, the best chemist would shrink from the task, unless impelled to it by weighty considerations. But although bodies usually contain but few elements, yet those are variously compounded, and according to their composition the processes of separation are devised. Hence arises the two fold division of *analysis*, or the chemical separation of a compound into its elements, qualitative and quantitative. By the first we determine the number and nature of the elements present, and by the second their relative quantity.

Works on elementary chemistry formerly contained a few pages on analysis, usually stowed away at the end of the work, and it was a mystery to the student to know how it was possible to find out all the facts represented in the body of the work. Now, however, we have many separate treatises on analysis, and among them works of considerable size. Faults they almost all have, for while one is too full, another is not full enough, while one is too scientific for the common reader, another is rather too practical to be scientifically accurate, rather too alchemistic for the modern chemist. The work before us has endeavored, and successfully too, to steer a course between the others. It is quite full enough for the ordinary purposes of life; it is strictly scientific, and yet its practical details are within the grasp of the tyro. It is said to form a part of the "Library of Useful Knowledge," and is certainly in accordance with the principles on which that work is conducted. We have first a long chapter devoted to the reagents, without knowing the quality of which, analysis is of little value. Then follows the behavior of the elements and their simple compounds to the reagents; and the remainder of qualitative analysis is devoted to the processes by which the constituents of a compound are discovered. We ought not, however, to omit a mention of tables at the close of this part, for the systematic qualitative analysis.

The second part, quantitative analysis, treats largely of the methods of determining the weights of the constituents which have been found in a compound, and is followed by chapters on peculiar kinds of analysis, such as that of organic bodies, of mineral waters, soils, ashes of plants, &c.—Tables of comparison between the Centigrade and Fahrenheit's thermometers, of the strength of certain acids and alcohols, and of calculations for analysis, close the work.

The author has succeeded in presenting to the public an excellent practical treatise in a condensed form. By inference from the present work, we should say that he is a good chemist, thoroughly conversant with his subject, for although he gives but little original matter, it requires a considerable store of knowledge and a good judgment, also, to compile such a book. If we be asked, how it compares with other similar works, we would say as chemists, that we will have it, and use it, although we have nearly all the treatises on analysis that have been issued. No treatise on analysis can replace that of Rose, but for the common walks of life it is far too full and scientific. Fresenius' work is an excellent one, less full, but still too much calculated for the atmosphere of the scientific chemist. The same may be said of Parnell's essay. As we have said, the present work is more practical, by which we mean in common parlance, is better adapted to the use of those who do not consider chemistry their profession. If we were inclined to find fault with it, we would say that it might be still more practical, if its object be what we have supposed.

In regard to the American edition, the editor's industry seems untiring, for we have not long since noticed other works which he has either written entirely or edited and enlarged. He has added matter not contained in the original, and processes which have appeared since it was written. Some of these additions are incorporated in the body of the work and appear as the author's, to which we doubt not he would not object. There is perhaps one point which the author might regret, as we do for him, that the *manipulations* or handling apparatus in analysis has been omitted, for it certainly destroys the unity of the work. It is hardly a sufficient excuse to refer to an original and independent work on manipulations by the editor, for although that work is much fuller and an excellent work of the kind, yet a sufficient amount of manipulation was introduced by Noad, to correspond with the main scope of his present treatise. B.

JOURNAL
OF
THE FRANKLIN INSTITUTE
OF THE STATE OF PENNSYLVANIA
FOR THE
PROMOTION OF THE MECHANIC ARTS.

SEPTEMBER, 1849.

CIVIL ENGINEERING.

Contributions to Railway Statistics, in 1846, 1847, *and* 1848. *By* Hyde Clarke, Esq.

(Continued from page 78.)

No. 9.—*Sand Traffic.* The sand on the Bodmin and Wadebridge, and Hayle Railways, (15,264 tons in 1847,) is sea-sand used as manure. Sand is used for building, agricultural, and domestic purposes. That carried on the Croydon is partly for sanding floors.

The rates are as follows:—

London and Croydon, - -	3·75*d.*	per ton	per mile.
Bodmin and Wadebridge, - -	3·00	"	"
Leicester and Swannington, -	2·75	"	"
Wishaw and Coltness, - - -	2·20	"	"
Arbroath and Forfar, - - -	1·97	"	"
Lancashire and Yorkshire, - -	1·33	"	"

On the Durham and Sunderland Railway, ballast is carried for shipping purposes. The return stands thus—

1845.	1846.	1845.	1846.
30,356 tons.	36,567 tons.	£506	£609

No. 10.—*Slate Traffic.* There is little information as to the quantity of slate carried. In the year ending 1846, there were carried on the Wishaw and Coltness Railway 1280 tons, for which £41 were received.

The rates for carrying slates per ton per mile are as follows:—

Ballochney, - - - - -	3·0*d.*
Newcastle and Carlisle, . - -	2·0
Wishaw and Coltness, - -	1·3

No. 11.—*Bricks and Tiles.* That railways cause a large saving in many places in the carriage of bricks is shown by the quantities carried. Many new brick-fields and tile-works have been opened to take advantage of these facilities, as well as of the cheap coal,—in the same manner as they are opened near canals.

The rates of carriage per mile per ton are as follows:—

Bodmin and Wadebridge,	4·00*d.*
Ballochney,	3·00
Leicester and Swannington,	3·00
London and Croydon,	3·00
London and South Western,	2·09
Maryport and Carlisle,	2·09
Wishaw and Coltness,	1·95
Whitehaven,	1·80

The only return of tiles carried for building or agricultural purposes, is that of the Wishaw and Coltness Railway, for the year ending June 30, 1846, tons 502. Receipts £20.

The only return of clay carried for brick making, pottery, or other purposes, is that of the Wishaw and Coltness Railway, 1846, tons 346; and 1847, tons 475. Receipts, 1846, £6, and 1847, £8.

The rates for the carriage of bricks are generally too high, and are exclusive of loading. Twopence per ton per mile would be enough.

The above returns give no means of calculating the quantity of bricks and tiles carried on the whole length of railway.

No. 12.—*Miscellaneous Mineral Traffic.* Besides the articles already enumerated are many others, as lead ores, copper, brass, lead, and tin manufactured, salt, sulphur, Roman cement, glass, pottery, fullers' earth, &c.; but as to which no information is to be got.

The rates for carrying salt are as follows, per ton per mile:—

Bodmin and Wadebridge,	4·00*d.*
Newcastle and Carlisle,	2·50
London and Brighton,	2·24
Lancashire and Yorkshire,	1·32

The rate for carrying fullers' earth on the London and Brighton Railway is 2·24*d.* per ton per mile.

No. 13.—*Mineral Traffic.* The whole mineral traffic shows the following result in tons:—

	1845.	1846.	1847.
Coal and Coke,	7,000,000	8,900,000	8,900,000
Ironstone,	400,000	500,000	600,000
Iron,	230,000	230,000	300,000
Dross,	——	110,000	110,000
Copper and Tin,	23,000	23,000	23,000
Limestone and Lime,	200,000	250,000	300,000
Building Stones,	200,000	400,000	600,000
Sand,	30,000	30,000	37,000
Ballast,	30,000	36,000	36,000
Bricks and Tiles,	2,000	5,000	5,000
Miscellaneous,	——	280,000	300,000

All these amounts, except for coal, are far below the mark; but they establish a total mineral traffic in 1847 of not less than 11,200,000 tons, besides unenumerated articles.

No. 14.—*Timber Traffic.* The rates for the carriage of timber are as follows:—

Whitby and Pickering,	5·00*d.*	per ton	per mile.
Ballochney,	3·00	"	"
Whitehaven,	3·00	"	"
Bodmin and Wadebridge,	2·50	"	"
London and South Western,	2·50	"	"
Wishaw and Coltness,	2·35	"	"
Maryport and Carlisle,	2·33	"	"
Lancashire and Yorkshire,	2·24	"	"

Timber is, in some returns, mixed up with stone traffic.

No. 15.—*Building Traffic.* On the whole, railways afford great accommodation to the building interests, though not to that extent which they may and will do when the traffic is more developed.

The following is an estimate of the traffic carried on for building purposes under each head:—

	Tons. 1845.	Tons. 1846.	Tons. 1847.
Stone,	200,000	400,000	600,000
Bricks and Tiles,	2,000	5,000	5,000
Timber,	40,000	40,000	50,000
Lime,	50,000	50,000	50,000
Sand,	10,000	10,000	10,000
Total,	302,000	505,000	715,000

The rates for the carriage of each of these articles, though below those on roads and canals, are still too high for the development of the traffic. It is a great disadvantage that most of these articles—stone, timber, and bricks—give much trouble in loading and unloading.

No. 16.—*Fish Traffic.* This traffic is of the greater importance, as it gives a positive addition to the supply of food in the country, and is therefore of great national benefit. Railways stimulate the production, or economise the cost of production, of grain, meat, and other articles of food; but all fish that can be carried inland, is so much added to the resources of the country. In this respect railways have done much, and can do more, both for the supply of food to the country, and the promotion of the fisheries.

In 1845, I estimated the railway traffic in fish at 13,000 tons, which must have been much below the mark.

The following is an estimate of the amount now conveyed:—

Districts.—Scotland,	2,000	tons.
Northern,	4,000	
Midland,	2,000	
Western,	2,000	
South Western,	4,000	
Southern,	4,000	
Eastern,	25,000	
Total,	43,000	

This traffic is very remunerative, and does not bring less than 10*s*. per ton. If parcels were taken into the account, the gross tonnage of fish carried may be reckoned as 70,000 tons; or, on the lowest computation, the food of as many individuals.

No. 17.—*Grain Traffic.* The conveyance of grain and flour is irregular; for though there is a fixed quantity carried to the local markets, the import of foreign corn is fluctuating.

The rates are as follows, per ton per mile:—

Bodmin, - - - - - -	4·00*d*.
Maryport and Carlisle, - - -	4·00
Whitby and Pickering, - -	4·00
Whitehaven, - - - -	3·10
Ballochney, - - - - -	3·00
Wishaw and Coltness, - - -	2·32
Lancashire and Yorkshire, - -	2·29
Arbroath and Forfar, - - -	2·12
Norfolk, - - - - - -	1·25

The amount of grain and meal carried by railway is certainly not under a quarter of a million of tons, and most probably exceeds three hundred thousand tons.

Through the kindness of Mr. Waddington, I have been favored with the following return of grain, flour, and seed, carried for the London markets by the Eastern Counties Railway:—

Half-year ending	Flour. Sacks.	Malt. Qrs.	Wheat. Qrs.	Barley. Qrs.	Oats. Qrs.	Beans. Qrs.	Peas. Qrs.	Seed. Sacks.
June 26, 1847,	126,269	99,114	20,850	4,409	11,326	3,542	1,079	15,099
Dec. 25, 1847,	113,365	81,688	24,287	14,888	2,934	3,239	1,999	9,904
June 24, 1848, to	149,957	139,078	26,649	9,990	16,426	1,858	931	11,445
Aug. 12, 1848,	45,360	28,300	14,847	789	2,132	407	140	2,971

Not knowing the average weights of the above, they cannot be reduced into tons.

No. 18.—*Provision Traffic.* There are no means of estimating the provision traffic on railways, but such returns as there are show that it is very great.

The rates charged are as follows, per ton per mile:—

London and Brighton, - -	5·69*d*.
Preston and Wyre, - - -	4·00
London and South Western, -	2·57

Ale and beer are carried largely on the South Western, Newcastle and Carlisle, and other lines. The rates on the London and South Western are 2·09*d*. per ton per mile, and on the Durham and Sunderland, 2*d*.

To the tonnage of provisions must be added that of fish and grain, which gives the following returns for 1847:—

Fish.—	Great North of England,	1,000 tons.
	Norfolk,	12,000 "
	Whitby and Pickering,	1,100 "
Grain.—	Great North of England,	6,000 "
	Slamannan,	2,600 "
	Wishaw and Coltness,	1,300 "
Provisions.—	Eastern Counties,	30,000 "
	Lancashire and Yorkshire,	117,312 "
	" Preston and Wyre,	5,220 "
	London and Brighton,	3,632 "
	London and South Western,	40,665 "
	Norfolk,	25,000 "
	South Eastern,	10,000 "

In 1845, I estimated the supply of provisions to the London markets by railways as follows, to which I subjoin a new estimate. This does not include cattle.

	Tons. 1845.	Tons. 1848.
South Eastern, - - -	7,000	10,000
Brighton, - - - - -	5,000	30,000
South Western, - - -	20,000	20,000
Great Western, - - -	30,000	40,000
London and North Western, -	30,000	30,000
Eastern Counties, - - -	15,000	100,000

Among these articles are fresh fish, meat, milk, butter, fruit, &c., which cannot be brought from great distances except by railway. Milk is now largely carried on the Eastern Counties and other railways, under arrangements by which the companies take back the empty cans.

The metropolis is now the seat of a considerable trade in provisions, supplying to the country towns, fish, prime beef, poultry, fruits, and articles of foreign provision.

The whole provision traffic of each district, including fish and grain, may be estimated as under.

District.	Tons.
Northern, - - - -	100,000
North Western, - - -	200,000
Midland, - - - -	50,000
Western, - - - - -	50,000
South Western, - - -	30,000
Southern, - - - - -	50,000
Eastern, - - - -	200,000

This estimate does not include Scotland. It is very vague and much under the mark.

No. 19.—*Manure Traffic.* This traffic is of great value to the agricultural interests, but there is a want of adequate information respecting it.

The rates are as under, per ton per mile.

Newcastle and Carlisle, (guano)	2·50*d.*
London and Brighton,	2·24
Arbroath and Forfar,	2·12
Leicester and Swannington,	2·00
Lancashire and Yorkshire,	1·33
Wishaw and Coltness,	1·10
York and North Midland,	1·00

Lime and sand are likewise carried as manures.

It is much to be regretted that no adequate measures are taken for applying the manure of towns. In the metropolis alone, the waste cannot be less than what would be equivalent to raising food for a million of people.

The following is an estimate of the whole amount of manures carried:

Lime,	210,000 tons.
Sand,	30,000
Manure,	40,000

The whole quantity is, perhaps, about three hundred thousand tons, and it may be safely taken that there is a production of food for a hundred thousand individuals effected by means of railway transit.

Bones form a regular article of transit on some of the railways. The charge on the Arbroath and Forfar Railway is 2*d.* per ton per mile.

No. 20.—*Miscellaneous Agricultural Traffic.* Many small articles are included under the head of agricultural traffic, as to which there are a few scattered details in the returns.

On the South Eastern Railway hops are carried. This is a season traffic, carried on one-half year only. The number of tons in 1847 was 7248, and the receipts £7741.

The rate of charge on the London and Brighton is 2·5*d.* per ton per mile.

Malt is not carried so much by railway as might be expected, because the malt gets shaken up, and then measures less on delivery, because it cannot be so well heaped up. As the quality of the malt is not affected, this is only a temporary prejudice on the part of the dealers.

The charges for carrying malt are, on the London and South Western Railway, 3*d.* per ton per mile, and on the London and Brighton 2·68*d.*

Bark is carried on most of the Southern lines. The rates are, on the London and Brighton, 2·68*d.*, and on the London and South Western, 2·57*d.*

Brooms are manufactured near the London and South Western Railway, and are carried at the rate of 2·09*d.* per ton per mile.

Hay is reckoned hazardous, from its liability to catch fire from the engine sparks. The quantities carried and the amounts received on the Newcastle and Carlisle Railway are—

1846.	1847.	1846.	1847.
968 tons.	1003 tons.	£892	£879

The rate of carriage on the above railway is 5*d.* per ton per mile.

There are no details as to wool traffic, though wool of home and foreign growth is carried. The rate is 3*d.* per ton per mile.

There is a return of potatoes carried in 1846 on the Wishaw and Coltness Railway, 43 tons at 2·35*d.* per ton per mile, the receipts being £2 only.

The rates for hides are, on the London and South Western, 2·5*d.* per ton per mile, and on the London and Brighton, 3·5*d.*

Civ. Eng. & Arch. Jour., Nov. 1848.

To be continued.

Railway Bridges.

Upon the extension line of the Blackwall Railway, from Stepney to Bow, are two bridges, which are of a peculiar form, and the first of their class erected for railway purposes. The roadway upon them is supported on wrought iron girders, placed transversely between two arches or ribs formed entirely of wrought iron. The clear span of one is 120 feet, of the other 116 feet 8 inches. Each arch or rib of the latter bridge, which carries the railway over the Regent's Canal, is formed of a box built with iron boiler plates $\frac{1}{16}$ in. in thickness, and angle iron firmly riveted together, its breadth being 2 feet 10 inches, its depth about 2 feet, and sectional area 81 square inches, and is connected at the base by a wrought iron tie-bar, which receives the horizontal thrust of the arch, and is formed of links having a total sectional area of 69 square inches, bolted together with bolts $2\frac{3}{4}$ in. in diameter, aided by eight others at each joint, $\frac{3}{4}$ in. in diameter. Between the tie-bars and the arch a system of vertical and diagonal bracing has been introduced, so as in a manner to distribute the weight of passing loads equally over the whole arch. These ribs so formed are laid in cast iron plates, fixed at one end and free to move at the other over rollers, so as to allow scope for the expansion and contraction of the metal. The clear interval between the bearings is 116 feet 8 inches, and the rise of the arch is 8 feet to the underside of the box of which it is formed, the roadway being beneath the arch, and about 2 feet above the bottom of the tie-bar.

The structure is exceedingly light, but appears, nevertheless, sufficiently strong to carry the weights which may come upon it in practice, so far as the areas of the arch and bowstring, or tie, are concerned, and has stood the test of a dead weight of 240 tons, (in addition to its own weight of 59 tons,) distributed in weights of $34\frac{1}{2}$ tons at equal distances over its length, with a deflexion of $3\frac{1}{16}$ inches, and recovered entirely its original position upon the removal of the load. As this proof exceeds considerably any weight that can be brought upon it in practice, I am of opinion that it may be used with safety for the passage of trains; but as it is of so novel and light a construction, and the action of the cross-bracing and connexion of the tie-bars have not been ascertained by continued experiments of moving weights, I should recommend that it be examined from time to time, so that any defect, if it should exist, might be ascertained, more particularly as the weight of the whole bridge, including the double line of roadway and covering, only amounts to 194 tons, and is very easily set in vibratory motion by any moving power.—*Capt. Simmons's Railway Report.*

Lond. Min. Journ., No. 718.

Report upon the Use of Anthracite Coal in Locomotive Engines on the Reading Railroad, made to the President of the Reading Railroad Company, by George W. Whistler, Jr., *April* 20, 1849.

(Continued from page 87.)

Conclusion.

In concluding this Report on the use of anthracite coal in locomotive engines, with reference to the present practice and prospective results upon the Reading Railroad, I would offer a few remarks touching the facts just recited, confident that these facts comprehend all that relates to mineral fuel in locomotive engines which is desired to be known by your company, and will establish the proportion of coal to wood consumed, and also the extra expense, in repairs of engines, consequent upon the use of this fuel.

The results of the observations upon the Reading Road have been given in detail, and the proportion of coal to wood consumed for equal amounts of work done, is shown to be 1 ton of anthracite coal in the Baltimore engines, to 1·8 cords of wood in the Reading built engines, 1·64 cords in the eight-wheeled Baldwin engines, and 1·37 cords in the engine Champlain, built also by Mr. Baldwin.

The apparent discrepancy in these results may be accounted for in the effect produced by cutting off the supply of steam to the cylinders of some of the engines after a portion of the stroke is made; which, in well proportioned engines, results in an economy of fuel. Of the engines under consideration, the Baltimore coal-burners and the Champlain are cut-off or full-stroke engines at pleasure, while the eight and six-wheeled wood engines are worked at full stroke only.

In making comparisons from the consumption of fuels, I shall endeavor to show, from the relative merits of these several engines, how coal may reasonably be expected to compare with wood, when all the engines are using fuel economically, taking the Champlain for the standard, as the best proportioned engine on the road for the adhesion she has to overcome, and as comparing favorably with like engines upon other railways in her consumption of fuel.

Engines.	Adhesion to overcome.	Size of cylinder.	Consumption of fuel.	Remarks.
Champlain, ...	20·0 tons.	16·0×18	10·25 Cords.	Cut-off.
Baltimore Coal Engines,	25·0 "	16·5×20	9·00 Tons.	"
Eight-wheeled Baldwin,	22·5 "	15·5×20	13·75 Cords.	Full stroke.
Six " "	19·5 "	15·0×18	13·00 "	"
Six " Reading,	20·2 "	14·5×20	13·62 "	"

The water evaporated by these amounts of fuel I am not able to state, except in the instance of the coal engines at 14,400 gallons, and the eight-wheeled wood engines at 16,200 gallons. This element for all the engines would, however, facilitate their comparison, though no strictly scientific investigation is aimed at, and none was contemplated at the time of making the observations.

It will be seen, by inspecting the above table, that the cylinder power of the Baltimore coal engines is less, for the adhesion they have to overcome, than the Champlain's; and therefore they require to be worked either on the full stroke, or, if on the cut-off, under a very high pressure of steam, which results, indirectly, in the greater consumption of fuel for work done. To understand this clearly, it must be borne in mind that the use of the cut-off on coal engines has a more important bearing on the economy of fuel than the same arrangement upon a wood-burning engine, and for these reasons: when the coal engines are worked upon the full stroke, the exhaust is very strong, and the draft through the fire proportionally increased; this soon produces an exceedingly hot fire, and every fresh supply of coals thrown upon it at once crumbles and compacts upon the grate, offering increased resistance to the passage of air through its mass, while less perfect combustion results, and much of the finer coal upon the surface is carried through the tubes and wasted. This "*cutting-up*" of the fire, as it is termed, will take place when necessity requires that the engine should be worked upon the full stroke, and for this reason the cut-off becomes indispensable to a good coal-burning engine.

The first effect produced by a change from the full stroke to the cut-off is that of lessening the draft through the fire by the moderated exhaust in the stack, evaporation then goes on more slowly in the boiler, and would reduce the pressure of steam necessary to working on the cut-off, were there no means of again increasing the intensity of the draft. The variable exhaust, however, furnishes this with facility, and evaporation again becomes rapid, though with much less disturbance to the fire. All these considerations were well understood at the time the Baltimore coal engines were being constructed, and the necessity for cylinders even of a greater diameter than 16·5 inches, in anticipation of an adhesion of only twenty-three tons, was urged by the builder, but not allowed by the engineer of your road. This restriction, together with the increased weight of the engine beyond that anticipated, has impaired the beneficial effects of the cut-off on the Baltimore coal engines to such an extent, that economy in the consumption of steam, and more quiet combustion of coal, is almost counteracted by the rapid evaporation required for the small cylinders. I would not be understood by this to controvert the received truth, that the same quantities of heat will evaporate equal quantities of water under all pressures; for so far as this question alone is considered, mere size of cylinders could have no effect in increasing or diminishing the quantity of fuel consumed; but for the practical difficulties just stated, and the fact that, for higher pressures, higher temperatures are required, and therefore radiation from all parts of the boiler must take place to a greater extent, a larger expenditure of fuel will result. To this loss there must also be added that caused by leakage, which is in direct proportion to the pressures; and when it is required to carry steam very high, self-preservation teaches men to keep the boiler blowing off all the time, as the only surety that steam is not made too fast.

When the Baltimore engines are worked on the full stroke, they make an abundance of steam with seven inches area of blast-pipe, though the effect upon the fire is to *cut it up*, as explained; but when working on the cut-off, the area of the blast-pipe requires to be so reduced, that much of the ill effects on the full stroke are felt, and the resistance due to the blast-pipe is also greatly increased, for its area may be reduced to 2·25 inches. No better proof of the inadequacy of the cut-off alone, to ensure economy with the present size of cylinders, can be offered than the fact that, except where attention has been paid by the engine-man to the variable exhaust, the economy due to the cut-off has not resulted from its use.

During the early working of these engines on the Reading Road, it was with much difficulty that men could be induced to use the cut-off, and the engines were for some time worked on the full stroke, with a consumption of about 10·5 tons per round trip; now the cut-off is used entirely on all the engines, and yet, by referring to the observations made upon the Ohio, her consumption of fuel is not diminished; while, again, it is seen that the same engines have made trips over the road under the same circumstances with one-half this quantity of fuel.

Where so much depends upon men, it is almost impossible to say what may be accomplished with the engines as at present proportioned. The best results obtained with these engines show that one ton of coal is equal to two cords of wood in the Champlain, and the average every-day work upon the road shows that they compare with this engine as 1 to 1·37; this is allowing nine tons of coal to the round trip, a quantity, however, which they do not consume, for I should estimate that one ton of this is thrown or wasted from the tender, the floor of which is grated; coal, moreover, is so plentiful on the Reading Road that care is not taken to preserve, for stationary purposes, that which is not considered the best for locomotives; but, without regard to this waste, I am of opinion that the engines, as they are constructed, may be made to do their work every day, with a consumption of fuel which shall not exceed one ton of coal for 1·62 cords of wood in the best wood-burning engine on the road. With the other wood-burning engines, the coal-burners would compare more favorably, even should the cut off be applied to them. It is quite practicable to substitute cylinders 18 inches in diameter on the Baltimore coal engines, in place of the 16·5 inches, and then the consumption of coal to wood, in all probability, would bear that proportion which experience proves attainable, viz: one ton of anthracite coal to two cords of wood.

In reviewing all the facts touching the consumption of coal in locomotive engines, I would draw your attention, in conclusion, to the table of fuels consumed on the Baltimore and Ohio Railroad, from 1833 to 1848. By an examination of this table it will be seen what experience alone can do in reducing expenditures, for it will be easy to detect the same engine through a period of years, and see her progressive economy in the consumption of fuel. Time and experience alone have accomplished this, and much may be expected for the Reading Railroad when, by the more general use of anthracite coal, it shall be regarded less a matter for experiment than an important element of railway success, to be perfected with care and attention.

The subject of extra cost for repairs of coal over wood-burning engines has been investigated with care, and it will be unnecessary here to enlarge upon what has already been said; the statements in detail show what the extra cost has been for the Baltimore engines, and I propose now to offer a few concluding remarks, suggested by past experience, upon the probable diminution in this expense.

Experience thus far proves that the copper fire-sheets are destroyed far more rapidly by the mechanical action of the particles of anthracite coal than by the intense local heat, and it becomes, therefore, a matter to be considered in renewing these sheets, whether copper may be made more secure against this unexpected deterioration, or whether it might not be well to resort again to iron; for if with care and means it can be made sound, it will not only be more economical in its first cost, but resisting as it does the mechanical action of the coal, will last a long time, and reduce the present cost for repairs to a very small amount.

The estimate which has been submitted of the actual cost of renewing the fire-place of the engine Baltimore is $378; if deduction be made for one-third less material in fire-place, (as explained,) this expense will be reduced to $345. The principal consideration, however, is, how frequently will these copper sheets require renewing?—the first copper fire-place has been destroyed after fourteen months' service over 23,845 miles of road, but experience has suggested improvements in renewing these sheets; additional stay-bolts have been put in the fire-box to prevent the copper, (which becomes very ductile by the intense local heat,) from being bulged out, and thus forming projections in the fire-place, readily acted upon by the particles of coal in motion. By this additional security to the Baltimore's copper fire-sheets, there is reason to believe that its fire-box will last two years, and I submit an estimate of the annual cost for repairs of these engines in accordance with this view.

Cost per annum for renewing fire-sheets 26 inches wide, after two years' service,	$172·50
Cost per annum for all other expenses, ...	207·00
Total cost per annum over wood-burning engines, ...	$379·50

Iron would undoubtedly be a better material for fire-sheets than copper, but the uncertainty attending its use has caused it to be discarded in coal engines upon roads of any length and business; this has been the case on the Baltimore and Ohio Railroad with the use of bituminous coal, though less destructive in its effects than anthracite. Iron-masters, however, have not been called upon for a quality of iron so superior as that required for the fire-places of coal engines; but when it is understood that such iron will command a ready sale and price, in proportion to its cost, I doubt not but it will be produced.

Whether copper or iron shall be the material used, experience shows that great advantage is gained by constructing the fire-boxes so that repairs and renewals of sheets, may be made with the least expense in time and materials; attention to this has resulted in producing coal engines of a later construction than those on the Reading Road, with their fire-places much simplified for this important consideration.

There are other parts of the fire-box liable to depreciation beside that part in the immediate vicinity of the coal fire, but they have not been referred to by me in the estimate for repairs just given, as experience had shown that such parts, (crown, side, and back sheets,) when more than twenty inches above the grate, had not required renewing, either on the Reading Road with the use of anthracite coal, or on the Baltimore and

Ohio Road with the use of bituminous coal; it was not, therefore, considered of sufficient importance to estimate in detail this possible extra expense, but it was believed that the above-mentioned sum of $379·50 would be found quite sufficient to cover all contingencies, even with the present early experience with coal engines; for when, after several years' working of an engine, it shall become necessary to renew these sheets, the cost per annum to cover this expense will be but small.

I have made no allowance for renewing the tube or flue sheet in the fire-box end of the boiler, as such extra expense is not necessarily entailed on coal-burning engines. Before sufficient experience had been had with coal engines, these tube sheets were put in too thin, and the distance between the tubes was so slight that the operation of caulking broke the head through from one tube to the other. I am aware that such difficulty is experienced with the Baltimore coal engines on the Reading Road, but the present mode of renewing such sheets will prevent this expense recurring sooner than with wood-burning engines.

In comparing the cost for repairs of fire-place, tubes, &c., in any engine on the Reading Railroad, with similar repairs of engines on other roads, the amount of fuel consumed in a given time is that which will determine their relative periods of duration. Now the Reading Road has great advantages over all other roads in this country, in the amount of work which can be done over it in a given time, for its grades are light and descending in the direction of the trade; and when the work of each engine on this road is compared with the work on an undulating road, such as the Baltimore and Ohio Road from Harper's Ferry to Cumberland, it will be found that the consumption of fuel is in proportion to the work done.

Road.	Measured distance per round trip.	Gross load per round trip.	Fuel consumed. Coal.
Reading, ...	190 miles.	900 tons.	9 tons Anthracite.
Baltimore and Ohio, . .	196 "	550 "	5 " Bituminous.

If the Baltimore and Ohio Road, (whose measured distance is about equal to the Reading Road,) had no grades exceeding the angle of repose; or, in other words, no grades which allowed a load to be propelled entirely by its gravitation, then the statement above would show the proportions of work done to coal consumed in running the same number of miles; but when the grades exceed this limit, (30 feet per mile, or 12·78 lbs. per ton for friction being taken as the angle of repose,) then all such distance must be equated in order to arrive at the whole work done. By referring to the description of the Baltimore and Ohio Railroad from Harper's Ferry to Cumberland, it will be seen that fourteen miles ascend, and ten miles descend, at a rate of thirty to forty feet per mile, thus making in the round trip twenty-four miles of this grade to be overcome, and the same distance to be moved through by the gravitation of the load. The ascending grade will be equal to about fifty-two miles of level road, and as steam is necessarily made and blown off in descending the twenty-four miles by gravity, it is estimated to be equal to taking the load over eight miles of level road; this will make sixty miles of equated distance in place of forty-eight of measured distance. The curvature of the Reading Railroad, and that portion of the Baltimore and Ohio Road between Harper's Ferry and Cumberland, is about equal.

Road.	Equated distance per round trip.	Gross load per round trip.	Fuel consumed.	Proportion of coal consumed to work done.
Reading, . .	190 miles.	900 tons.	9 tons Anthr.	1·00
Baltimore and Ohio,	208 "	550 "	5 " Bitum.	0·82

It has been shown that the miles run during the past year by the coal engines on the Reading Road, and by engines of the same class on the Baltimore and Ohio, were about 17,000, but, by the above table, it will be seen that the work done in the same time is in the proportion of 1 R. to 0·66 B. & O., and the coal consumed to do this work, in the proportion of 1 R. to 0·56 B. & O., consequently the duration of fire-places, &c., will be in the proportion of 0·56 R. to 1 B. & O. Anthracite coal, I presume, will always be more destructive in its effects than bituminous; but how much more so can only be known by experience; this much only is known: that a copper fire-place of one of the Baltimore and Ohio engines (the first one) has been removed after three years' service, over 54,000 miles of road, and a copper fire-place of one of the Baltimore coal engines on the Reading Road (the first one) has been removed after fourteen months' service, over 23,845 miles of road, which shows their durability for equal quantities of coal consumed to have been as 1 R. to 1·24 B. & O.

When the difficulties attending the use of anthracite coal in locomotive engines are considered in connexion with the entire want of experience with this fuel, on a scale adequate to the necessities of the Reading Road, it will not be too much to say that the Baltimore engines have been entirely successful as coal burners; the term is but comparative, and assigns no limit to the success which I believe will follow well directed efforts to improve such details as passing experience shall show to be necessary to insure greater economy of fuel, or greater durability of parts.

For the Journal of the Franklin Institute.

Description of an Iron Arched Bridge of 133 *feet span, across the Canal on Section* 5 *of the Pennsylvania Central Railroad. By* HERMAN HAUPT, ESQ., *Civil Engineer.* (WITH A PLATE.)

The chief peculiarity of this bridge consists in its *iron arch*, which is extended to a very considerable span, and furnishes a highly important practical test of the powers of resistance, both of the material itself and of the particular form in which it is employed. At the same time the application of the principle upon which the structure is erected has been made under circumstances which render it perfectly safe; for, in the event of the failure of the arch, the truss, without it, is more than sufficient to sustain the greatest load that can come upon the bridge.

The general arrangement of the truss is that of a Howe bridge, consisting of top and bottom chords of wood, with braces, counterbraces, and vertical rods. The braces are in pairs, and the arches pass between them. The counterbraces rest upon the arches, and are adjusted by means of set screws above and below.

The arch is constructed of a centre rib of cast iron, 7 inches deep, with upper and lower horizontal flanches, 5 inches wide; two rolled iron plates are placed on the top, and two on the bottom of the cast rib, breaking joint with the rib and with each other, and secured by clamps at proper intervals. Below the chords are solid cast iron skew backs; and castings, of suitable form to connect with the skew back and receive the ends of the arch, are placed on the top of the lower chord.

Believing that the failure of cast iron bridges results generally from the inequality of pressure upon the joints, it was proposed to obviate this difficulty in the present case, by interposing plates of annealed copper between the ends of the segments, so that if the arch should rise or fall by expansion or contraction, the comparatively yielding quality of the interposed material would distribute the pressure, and prevent the fracture which might be produced if the joint should open, and the pressure be thrown upon the upper or lower corners of the castings.

This intention was defeated by circumstances which rendered it necessary to hasten the completion of the work. The ribs were raised without dressing the joints, and the copper plates were therefore rendered useless, the inequalities of surface being too great to admit of their being advantageously employed. Under these circumstances a substitute was used which gave more satisfaction than could have been obtained by an adherance to the original design, and was much more economical. The joints were separated to the distance of one-fourth of an inch, and filled with spelter poured into them in a melted state; this was very conveniently done by binding a piece of sheet iron around each joint, and covering it with clay. The material introduced being nearly as hard as the iron itself, and filling all the inequalities of the surface, rendered the connexion perfect.

The pieces of castings were made with inch holes near the ends, through which rods were passed horizontally to assist in raising them. To support them when raised to their proper positions, pieces of board were nailed vertically from the top to the bottom chord, on each side of the truss, and short rods were passed through the holes in the ends of the castings, and through auger holes in the boards. By this arrangement the segments were held securely, and no obstruction was offered to the attachment of the arch plates, which were added by clamping one end and springing them around the arch by a rope attached to the other.

The most important advantage that was expected to be derived from the peculiar arrangement exhibited in this structure, was the practical test of the power of resistance of a counterbraced iron arch on a large scale, under circumstances which would render its failure, under any possible contingency, unattended with risk.

It has been observed that counterbraces are placed above the arch, resting against it by means of adjusting or set screws. In addition to this, there is a vertical post of oak between each pair of suspension rods, also terminating in a set screw resting on the arch. It will be readily perceived that, by loosening the lower counterbrace screws, and by tightening those on the posts, the bridge will be raised upon the arch, and the latter will then bear the whole weight both of the truss and its load. If the arch should prove unable to sustain this pressure, the truss would sink again to its original position and receive the weight.

The experiment thus far has been entirely successful, and shows that the counterbraced arch, which is the lightest and cheapest system possible, is perfectly reliable for spans of any magnitude; it is, in fact, a satisfactory test both of the principle and of the material.

The manner of adjusting the trusses, and the observations subsequently made, were as follows:—

1. All the lower counterbraces were unscrewed.

2. All the upper counterbraces were tightened, but not screwed hard

3. The levels were taken from a permanent level-mark at the foot of every suspension rod.

4. The set screws upon the posts were tightened by two men, with suitable wrenches, beginning at the middle and proceeding towards the ends; after once going over, the level was again taken, and the bridge found to be raised one-fourth of an inch. The same operation was repeated, and the rise found to be half an inch, which was sufficient to make it certain that the whole weight was upon the arch.

5. The upper counterbraces were examined and found to have become loosened; they were again screwed up; the main braces were loose;—all of which were necessary consequences of raising the truss upon the arch. The time at which these adjustments were made was about 11 o'clock, in July; the weather warm.

6. The bridge was again examined on the following morning; the weather was cool, and the contraction of the arch, from difference of temperature, had caused the posts and counterbraces to become loose, whilst the main braces were found to be in full action: in other words, by the contraction of the arch the weight was again thrown upon the truss.

7. The post and upper counterbrace screws were once more tightened, and as the heat of the day increased, the arch expanded and lifted the bridge to a greater height than on the preceding day.

8. While in this condition, the whole weight being upon the arch, the post and upper counterbrace screws tight, and the lower counterbrace screws loose, a locomotive was passed over the bridge, and observations made with a level and rod whilst it was running repeatedly backwards and forwards. The greatest variation from the level of repose was $\frac{1}{8}$ in. The arch rose slightly when the locomotive was upon the opposite side, and fell as much below its original position when it was on the same side as that upon which the observation was made. This was the effect anticipated; it was not to be supposed that the arch, in the condition it then was, would be perfectly rigid, as the lower counterbraces were all unscrewed, and the upper ones, as their resistance was not transmitted to the opposite extremities of the diagonals of the panels, could not act with full effect.

9. After an interval of several days, during which the arch and truss experienced no change, except that the lower counterbraces were screwed up, a 23-ton locomotive was passed several times over the bridge. No level was at hand with which to make observations instrumentally, but the eye could detect no motion in the arch; it appeared to be perfectly rigid

in every direction, and a subsequent careful examination could not detect the slightest opening or compression at the joints.

The observations made thus far have been sufficient to satisfy the writer of the correctness of his views in regard to the strength and rigidity of a counterbraced arch, and its applicability to spans of great extent. Upon this principle, an iron bridge can be constructed at less expense than is now sometimes incurred in the erection of wooden ones, and the durability, with proper care, is almost unlimited.

An iron arch constructed in a manner similar to the above, would be perhaps the cheapest and best support for an aqueduct. As the load in this case is always nearly constant and uniform, the curve of the arch should be a parabola.

No practical difficulty need result from expansion and contraction, particularly if iron tie-rods are not used for the lower chords. The counterbrace rods can be so proportioned and disposed as to compensate for changes in the arch and keep the tension constant.

AMERICAN PATENTS.

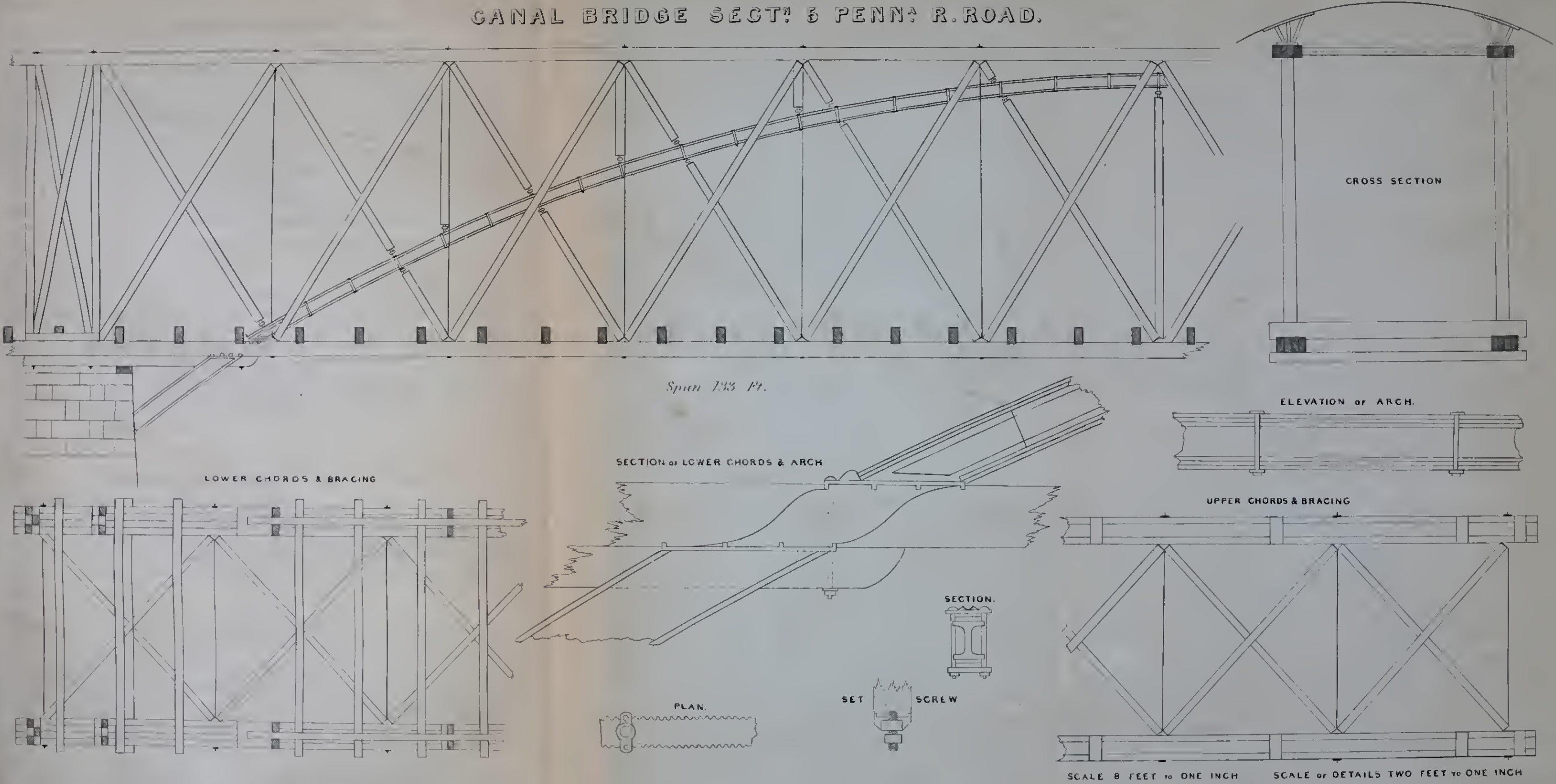
List of American Patents which issued in the month of November, 1848, *with Exemplifications by* Charles M. Keller, *late Chief Examiner of Patents, in the U. S. Patent Office.*

1. For an *Improvement in Machinery for Raising, Sawing, and Splitting Wood;* Cadet Crousillac, New Orleans, Jefferson county, Louisiana, November 7.

The patentee says,—"The nature of this invention consists in drawing the logs of wood found floating in rivers, or other logs, over horizontal rollers and under a gang of horizontal saws, at right angles to the same, attached to vertical stems, moving in mortises in a vibrating frame, and securing said logs by means of horizontal screws, jointed at their ends, and driven into the sides of the same, and sawing them into blocks of any desired length, and forcing the blocks or portions of the logs, after the screws are withdrawn from the same, forward on to an endless chain of parallel slats, by which they are conveyed and discharged on their ends under an iron weight moving vertically between slides and grooves, similar to the monkey of a pile-driver, and after inserting the sharpened edges of iron wedges in their upper ends, causing said weight to fall on said wedges, and split the blocks into pieces of the required size for fire wood; the machine being arranged together with a suitable frame, and operated by steam or other power."

Claim.—"What I claim as my invention, is the combination and arrangement of the mechanism for raising, holding, and sawing large logs into short pieces, with the mechanism for conveying and splitting the said short pieces into fire wood; the whole constituting one machine, operated by the power of a steam engine applied to the main shaft, in the manner herein set forth."

CANAL BRIDGE SECT^{N} 5 PENN^{A} R.ROAD.



2. For an *Improvement in Machines for Sharpening Instruments;* W. Z. & J. W. Chapman, Philadelphia, Pennsylvania, November 7.

The patentees say,—"The nature of our invention consists in a new combination and arrangement of known mechanical devices, whereby a rectangular grinding block, having a plain or fluted surface, is caused to move backwards or forwards under an adjustive turning holder, in which the various articles to be ground are held upon the face of the said block with ease and accuracy; also in securing over the ends of the grindstone adjustable bent metallic guards, to keep the articles being ground from slipping over the ends of the stone, and prevent the oil or water from flying off by its momentum at the time the motion of the stone is changed, and likewise to keep the oil or water supplied in sufficient quantity, and evenly spread over the surface of the stone, by means of the sponge or other absorptive substance secured upon their inner ends; and in combining with the reciprocating stone a flat revolving stone, which has likewise a turning adjustive rest connected with it."

Claim.—"What we claim as our invention, is the combination and arrangement of the adjustive turning holder with the grindstone, by means of which the apparatus is adapted to the accurate grinding of all manner of edged instruments. We also claim the combination of the vibrating clamp and turning holder with the adjustive sliding head, in the manner and for the purpose set forth. We also claim the combination of the grinding block with the guards, having sponges to be saturated with water or oil secured to their under ends, substantially in the manner and for the purpose set forth."

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3. For an *Improvement in the Composition of Slate Pencils;* Lewis J. Cohen, City of New York, November 7.

Claim.—"What I claim as my invention, is the mixing or combining, in certain proportions, the materials of alumina, (in any of its forms,) with French chalk, or with soap stone, in combination with water, for making of a clay or mass for making white slate pencils, and the process of making the same, as set forth."

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4. For an *Improvement in Suspender and Shoulder Braces;* H. Day and F. D. Hayward, City of New York, November 7; (ante-dated May 7.)

The patentees say,—"The nature of our invention consists in giving the required degree of elasticity to suspenders, shoulder braces, and other similar articles, by the use of an elastic ring, to which is attached the buckle and button leathers by means of a loop, which will slide along the ring nearest to the point of draught, whereby we are enabled to have an elastic spring in any required direction, with equal advantage in each."

Claim.—"What we claim as our invention, is the forming and rendering elastic suspenders, shoulder braces, riding belts, and other similar articles, by the use, in combination therewith, of the elastic rings, for the purpose of giving spring and draught, substantially as set forth."

5. For an *Improvement in Extension Tables;* George Pratt, Boston, Suffolk county, Massachusetts, November 7.

Claim.—"What I claim as my invention, is the combination of two or more sets of parallel bars, the machinery for extending and contracting the slide bars thereof, or moving them outwards and inwards, and the latching or unlatching contrivances, substantially as set forth. I also claim the said latching and unlatching contrivances, as constructed and applied to their slide bars, and operating (when they are moved by mechanism substantially as set forth) to connect or disconnect them, in manner as set forth. I also claim the manner of adapting the crank of the pinion shaft to said shaft, so that said crank may be moved or drawn outwards, and forced inwards, and turned upwards into a socket, and be made to clutch or engage with, and be disengaged from, the shaft, as occasion may require."

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6. For an *Improvement in Machinery for Stamping and Cutting Crackers;* Cyrus Baldwin;—assigned to J. & E. Baldwin, Goffstown, Hillsboro' county, New Hampshire, November 7.

Claim.—"I claim the combination of an air-tight cylinder and piston with each of the cutters, so as to operate in the manner set forth, and, by means of suction or the pressure of the atmosphere, raise the cracker or biscuit out of the dough or scraps, and prevent it from dropping out of the cutter while the latter is being elevated, as set forth; meaning to claim, in connexion with each cutter, an apparatus to create atmospheric pressure on the biscuit or cracker, substantially as set forth. I also claim the combination of the series of cutters or cutting mechanism and the two endless aprons, as made to operate together substantially as set forth. I also claim the revolvable flour duster, as combined with the endless apron, and used substantially as set forth."

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7. For an *Improvement in Filling Barrels with Flour;* B. Bowman and A. Kauffman, Orrstown, Franklin county, Pennsylvania, November 7.

Claim.—"What we claim as our invention, is a new and useful method of filling flour into barrels in a mill, and weighing the flour and barrel together by one process, by means of a movable trough suspended on axle points near the centre of its sides, giving a preponderance to that division of it that is farthest from the barrel, and a pair of platform scales fixed below the light end of the trough, upon one end of which scales the empty barrel is placed to receive the flour from the trough, and on the other end the weights are placed, with the end of a lever mortised on it also, which, rising with that end of the scales when the barrel has reached its weight, unloops or unhooks a rod or wire from a pin in the frame-work above, that stayed at rest an inclination towards the barrel while it was filling, and thus permits the trough, by its unequal balance, to reverse its inclination, and convey the surplus flour into a chest on the opposite side to receive it."

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8. For an *Improvement in the Manufacture of Elastic Cloth;* Richard Solis, City of New York, November 7.

Claim.—"What I claim as my invention, is the mode of preparing the cloth for the rubber, by stretching it in the manner set forth; and also the placing the rubber on the cloth obliquely, as set forth."

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9. For an *Improvement in Side Hill Ploughs;* Hayward Cox, Peach Bottom P. O., Grayson county, Virginia, November 7.

The patentee says,—"This improvement consists in securing a double mould board plough to the forward and back part of the land bar, at its lower part, and to an inclined rod extending from near the point of the land bar to the beam, at its upper forward part, in such a manner that the back and upper parts of said plough can be thrown on either side and secured there, in order to form a right or left hand plough, to throw the furrow either way, or can be secured immediately below the beam, to form a cultivator plough."

Claim,—"What I claim as my invention, is the employment of a horizontal plate, perforated with an opening made in the form of the letter E, and fixed to the head of the standard, in combination with the perforated triangular plate and curved dog or lever, and inclined rod, on which the double mould board and land side turns, by which the plough is alternately changed from a right to a left hand plough, for ploughing on the sides of hills, and also for converting it into a cultivator, for ploughing between potatoes, corn, &c., as set forth."

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10. For an *Improvement in the Duck Foot Propeller;* George Seibert, Hagerstown, Washington county, Maryland, November 7.

Claim.—"What I claim as my invention, is the opening and closing of the wings of a propeller, by means of the combination of a sliding rod furnished with racks, or with the reciprocating bar, and also with arms having pinion segments, and being connected through the arms with the wings of a propeller when not required to be reversed, as set forth. I also claim, in combination with the reciprocating bar to which are attached springs, the projections on the wings of a propeller, when said springs are employed to deaden the shock which would otherwise be felt on using said wings, in the manner set forth; not claiming the general plan of using springs to arrest motion or prevent shocks. I also claim, in combination, the reciprocating bar, springs, projections, wings, arms, toothed segments, sliding rod, projections, and slot, constructed and acting substantially as set forth."

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11. For an *Improvement in Tubes for Raising Lamp Wicks;* R. C. Overton, City of New York, November 7.

Claim.—"What I claim as my invention, is the manner of constructing the wick tubes so as to raise and lower the wicks conveniently, the same consisting of the concentric tubes, the slot in the outer tube, and the pin attached to the inner tube, working through the slot."

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12. For an *Improvement in the Screw Jack;* F. Ellis and B. S. Buckley, Roxbury, Norfolk county, Massachusetts, November 14.

Claim.—"We claim, in combination with the two ratchet wheels and lever apparatus for rotating them and their shaft, the two sets of screw mechanism extending from the shaft on which they are placed, the whole being constructed and made to operate substantially as set forth; not meaning to claim a simple duplication of a screw jack and lever apparatus, but meaning to claim the combination of the two jacks, or the double jack with but one lever apparatus, as set forth. We also claim the particular manner in which we construct the key lever, the frame, and dogged piece, so as to operate together: that is to say, the said key lever being made with a notch, and the said frame being made with a hole through its end piece, to receive said lever, and allow it and the dog piece to operate, and the other parts being constructed and applied together as set forth."

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13. For an *Improvement in Odometers;* William Oldroyd, Mount Vernon, Knox county, Ohio, November 14.

Claim.—"What I claim as my invention, is the combination of the circular inclined plane, attached to the hub of a carriage wheel, with the piston, click, and spring, for turning the cog wheels, pinions, and index, in the manner and for the purpose set forth."

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14. For an *Improvement in the Manufacture of Buckwheat Size;* William A. Comstock, Providence, Rhode Island, November 14.

Claim.—"What I claim as my invention, is the making of sizing for yarns from buckwheat meal, substantially in the manner or by the process set forth, the same enabling me, at about one-third the usual expense of preparing wheat flour size, to produce a much better and more substantial size, one more especially adapted for fine yarns or difficult weaving than any heretofore in use."

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15. For an *Improvement in Mills for Breaking and Grinding;* William Beal, Jr., Lowell, Middlesex county, Massachusetts, November 14.

Claim.—"What I claim as my invention, is the combined and simultaneous action of the teeth of the small cylinder, having a slow motion, with a series of stationary teeth, and with the teeth of the large cylinder, running at a high speed, substantially as set forth."

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16. For an *Improvement in Furnaces for Steam Boilers, &c.;* F. X. Wurm, Vienna, Austria, November 14.

Claim.—"What I claim as my invention, is the manner set forth of employing steam and heated air together, the same consisting substantially of the combination of the steam pipes, tuyeres, and close chamber or ash pit. And I also claim the employment of the two sets of tuyeres, for introducing steam and heated air in the manner set forth: that is to say, one being applied at the grate bars while the other is applied to the combustion pit, for the purposes substantially set forth."

17. For an *Improvement in Operating Brakes for Railway Cars;* C. B. Turner, Buffalo, Erie county, New York, November 14.

The patentee says,—"The nature of my invention consists in a certain new and useful combination of horizontal transverse turning shafts and pendant levers to them, to which are secured horizontal transverse bars, having concave rubbers to press against the peripheries of the car wheels, and intermediate suspended levers, with similar transverse bars and concave rubbers, and for the like purpose to those first mentioned, placed against the opposite sides of the wheels, the said pendant and suspended levers being connected by parallel longitudinal jointed screw rods and nuts, the upper end of the intermediate suspended levers being connected by transverse timbers, the several series of rubbers attached to each car being actuated simultaneously by the momentum of the car, and a corresponding resistance of the contiguous car, by acting against the sliding bumpers, springs, and bars, which, in turn, act against the horizontal transverse timbers that connect the upper ends of the intermediate suspended levers, by which the concave rubbers are made to clasp the wheels in pairs, and thus to arrest the motion of the car gradually, and without producing a sudden and violent shock, a similar operation being produced on the several cars of the train in quick succession, there being two series of rubbers and bumpers to each car, operated simultaneously; said brakes being so arranged and combined with windlasses on the platforms of the cars, by means of levers and connecting rods, and chains, that the rubbers can be brought in contact with the wheels thoughout the train simultaneously, by the brakeman simply turning one of the windlasses."

Claim.—"What I claim as my invention, is, 1st, Constructing the brake so as to act simultaneously on all the wheels of the car or cars of the train, on opposite sides, by the momentum and resistance of the several cars, and the consequent contact of the bumpers, which actuate the rubbers, and by which the motion of the cars is arrested: that is to say, I claim the combinations of the rubbers, levers, shafts, bars, and rods, arranged and operated in the manner set forth, or operated by manual power applied through the agency of the windlasses, chains, levers, rods, or other similar contrivances.

"2d, I claim the manner of constructing the sliding spring bumper, for operating the brake by the momentum and resistance of the cars, as set forth: that is to say, I claim the combination of the slide with the bumper and spring, constructed, arranged and operating in the manner set forth."

18. For an *Improvement in Rotary Valve Musical Instruments;* Thomas D. Paine, Smithfield, Providence county, Rhode Island, November 14.

The patentee says,—"My improvement consists in the introduction and application of a third or centre valve pipe through the roller of the instrument, which said pipe may be round or oval."

Claim.—"What I claim as my invention, is the introduction, use and application of the third or centre valve pipe, through the roller or rollers of all rotary valved metallic wind instruments, the whole being combined and operating as set forth."

19. For an *Improvement in Coffins;* Almond D. Fisk, City of New York, November 14.

Claim.—"What I claim as new, is the manufacturing of coffins of cast or raised metal, when made substantially in the form set forth: that is to say, corresponding nearly to the human form; and, in combination therewith, the making of the coffin in two nearly equal parts, united horizontally by the flanch, as set forth."

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20. For an *Improvement in the Roller Cotton Gin;* John Schley, Columbus, Muscogee county, Georgia, November 14.

Claim.—"What I claim as my invention, is the combination of the ginning rollers and shell with the tooth feeders, constructed and operating substantially as set forth."

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21. For an *Improvement in Side Hill Ploughs;* Iram Brewster, Stamford, Delaware county, New York, November 14.

The patentee says,—"The nature of my invention consists is having a hollow mould board, to enable the plough to be easily shifted from side to side in ploughing ridges of land without making a long head land turn. For this purpose the mould board of my plough, being very light in proportion to its size, can easily be shifted from one side of the beam to the other side, by means of the spiral spring and the pivots revolving in the sockets."

Claim.—"What I claim as my invention, is, 1st, the hollow mould board and its combination with the standard and the spiral spring, substantially as set forth. I also claim the combination of the hollow plough point with the mould board as set forth, so as to make the upper and lower sides of the mould board alike."

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22. For an *Improvement in the Machine for Plaiting Shirts, &c.;* Welcome Whitaker, Troy, Rensselaer county, New York, November 14.

The patentee says,—"The nature of my invention consists in providing two metallic plates, placed in a parallel position, attached to slides, and moving by levers on ways, and so regulated by stops and adjusting and set screws, as to let the folders alternately pass above each other, to the desired distance to give the proper widths to the plaits, or leaving alternately wide spaces to suit the pattern."

Claim.—"What I claim as my invention, is a single pair of folders, together with the stops, and adjusting and set screws, and the several appendages pertaining thereto, necessary to the convenient, parallel, and diversified action of the folders. I also claim the fixtures by which the cloth is suspended and delivered out during the operation of plaiting, as set forth."

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23. For an *Improvement in Book Safes;* James P. Gage, City of New York, November 14.

The patentee says,—"The nature of my invention consists in the introduction of a book safe, principally intended as a fixture in the pews of churches."

Claim.—"What I claim as my invention, is the spring and ledge, combined with the inverted casing, to be used and constructed as set forth."

24. For an *Improvement in Harvesting Machines;* Francis S. Pease, Buffalo, Erie county, New York, November 14.

Claim.—"What I claim, is the combination of the levers, connecting rod, and spring, with the double platform and rake, for the purpose of alternating and turning the latter, as set forth. I do not claim to be the inventor of a tight case for the back of the blade to run in, nor of slotted teeth to protect its edge; but what I do claim, is making a toothed blade case in uniform sections, each section having a tooth cast in one piece with it, the whole being attached to the rack bar, by screws or otherwise, in such a manner that, if the tooth or case of any section should get broken, it may readily be replaced by an extra one, cast from the same pattern and kept on hand for that purpose, the rack thus made being equally efficient to protect the stock from dirt and obstructions with the solid case, and capable of being more easily and cheaply repaired. I also claim the manner in which the position of the point of draught is changed, by means of the slides and clamp screws, as set forth."

25. For an *Improvement in Filter Stop Cocks;* A. & H. Johnson, City of New York, November 14.

Claim.—"What we claim as our invention, is a filtering apparatus having two water chambers, one above and the other below, the filtering diaphragm is the central pipe with four passages, arranged substantially as set forth, in combination with the two-way cock, the passages of which are arranged substantially as set forth, for the purpose of drawing filtered or unfiltered water, and reversing the direction of the current through the filtering medium, for the cleansing thereof, as set forth."

26. For an *Improvement in Planing Irregular Forms;* A. Goodman and William Gibbs, Dana, Worcester county, Massachusetts, November 21.

The patentees say,—"The nature of our invention consists in forming cams or revolving guides, to govern a revolving cutter mounted in a swing frame, whereby wood may be planed of a great variety of shapes, in a smooth and regular manner."

Claim.—"What we claim as our invention, is the combination of the vibrating cutter frame with the cams, the jointed ratch, and adjustable straight or curved inclined plane, for the purpose of planing irregular spiral sided forms."

27. For an *Improvement in the Self-Feeding Machine for Charging Percussion Caps;* Marvin W. Fisher, Washington City, D. C., November 21.

Claim.—"What I claim as new, is, 1st, the manner of conducting the caps from the hopper, and depositing them in the apertures in the wheel, by means of the vibrating inclined groove, the rotating brush wheel, the feeding hand on the arm, the feeding finger connected to the arm, respectively constructed, arranged, and operating with each other, and with the scolloped edged wheels, the vibrating levers, the cams, the weights, the cords, the vibrating vertical lever with its arms, the vibrating horizontal lever, and the ratchet, combined in the manner substantially as set forth.

"2d, I claim the combination of the cam on the main shaft, the vibrating lever, the charger, and the ratchet, with each other, and with the tube, the magazine, and wheel, for the purpose of rotating the wheel, and depositing a charge of fulminating powder in each cap placed in the wheel, substantially as set forth.

"3d, I claim the combination of the rotating brush wheel with the main shaft, and with the wheel, for the purpose of removing any fulminating powder that may be scattered by the charger upon the flanches of the caps and the face of the wheel.

"4th, I claim making the shaft or shank of the punch elastic, substantially in the manner and for the purpose set forth.

"5th, I claim the combination of the punch shank, the guiding and supporting tube, the pinion on the tube, the cog wheel and cam on the main shaft, with each other, and with the ring and spring encircling the lower end of R, for the purpose of imparting a rotary movement to the punch, pressing the same for a suitable length of time upon the fulminating mixture in a cap, and then elevating and retaining the punch while the wheel is moved, substantially by the arrangement and in the manner set forth.

"6th, I claim the manner of preventing the caps from turning in the apertures in the wheel, while they are being operated upon by the punch, and also preventing the caps from being drawn out of their apertures in the wheel by the punch, by means of the retaining arm at the lower end of the vertical rod, enclosed by a helical spring, and operated upon by the cam on the main shaft, substantially in the manner set forth.

"7th, I claim the manner of throwing the caps, when charged, out of the apertures in the wheel, into a proper receptacle, by means of the cam wheel on the main shaft, the rod, lever, punch, spring, and guiding spring, combined and operating with each other, and with the open sided funnel, substantially as set forth."

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28. For an *Improvement in Dividers or Measuring Compasses;* Chas. Reiffel and N. Thorn, City of New York, November 21.

Claim.—"What we claim as our invention, is the two pivot plugs, constructed and adjusted as set forth.

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29. For an *Improvement in Scythe Fastenings;* Oliver Clark, Brunswick, Medina county, Ohio, November 21.

Claim.—"What I claim as my invention, is fastening the scythe to the snath by means of two projections arising from the metallic plate, one of which being movable; they are made to grasp the scythe's shank in such a manner as to confine it firmly between them and upon the plate, attaching it to a snath of any approved form or construction, substantially as set forth."

30. For an *Improvement in Grass Cutting Machines;* William Boone, New Hope, Lincoln county, Missouri, November 21.

Claim.—"What I claim as my invention, is the combination and arrangement of the hinged scythe and radial boxes, as constructed and operated with the vertical pendant axle, and gearing to propel the same; said scythes being so constructed and arranged as to form nearly a circular cutting edge, while each segment of the cutter forms, by itself, a hinged segmental scythe, that can be raised or disengaged from the radial box at pleasure with very little inconvenience for grinding the edge, or for any other purpose, and be again restored to its place, the cutting being performed on the convex edge of the scythe, instead of the concave edge, as with the ordinary scythe.

"2d, I claim the manner of sustaining and supporting the pendant revolving axle, by means of the extended cap of the frame, in combination with the extended axletree, as set forth."

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31. For an *Improvement in Couplings for Axles and Bolsters;* David W. Seeley, assignee of George Brown, Carlisle, Schoharie county, New York, November 21.

The patentee says,—"The nature of my invention consists in providing a better means of connecting the fore wheels of a carriage or other vehicle to its body, than the common ring bolts and connexions."

Claim.—"What I claim as my invention, is the combination of the body plate, the axle plate, and the ring bolt, constructed and connected to the body, the axle, and each other, as set forth, for the purpose of making a safe connexion of the fore axle with the body of the vehicle, or its perch or other contrivance, by means of the two metallic plates and bolt, as set forth."

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32. For an *Improvement in Harvesters;* Uriah H. Goble and Alexander Stuart, Urbana, Champaigne county, Ohio, November 21.

Claim.—"What we claim as our invention, is, 1st, the combination and arrangement by which we cause the rotating rake to pass horizontally across the platform, to wit: securing the rake to the shaft in such a manner that it can slide freely to and from the same; placing rollers upon the projecting ends of the bar, (parallel with the rake head,) operating with the horizontal ways secured to the inner sides of the vertical ends of the platform, substantially as set forth.

"2d, We claim the imparting an unequal motion to the rake as it revolves, for the purpose set forth, by means of the eccentric pinion matching with the elliptical toothed wheel, substantially as set forth.

"3d, We claim, also, the imparting to the rotating rake a horizontal movement from the front to the rear edge of the platform, combined with a gradually diminishing rate of speed, substantially in the manner and for the purpose set forth."

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33. For an *Improvement in Harvesting Machines;* Daniel Cushing, Aurora, Kane county, Illinois, November 21.

Claim.—"What I claim as my invention, is, 1st, the making the vibrating cutters sickle-edged, moved in the manner and for the purpose set forth.

"2d, I claim the manner of combining and arranging the double cranks and axles of the rakes, so as to cause them to turn together, and at the same time to turn the two endless rakes, as set forth.

"3d, I claim the particular arrangement of the transverse endless revolving rakes, in combination with the other rake for delivering the cut grain upon the platform, as set forth."

34. For an *Improvement in Axle Boxes;* John Lightner, Roxbury, Norfolk county, Massachusetts, November 21.

The patentee says,—"The nature of my invention consists, 1st, in applying to, or combining with, the box and axle a stuffing box, so disposed as to effectually prevent the admission of dirt or dust into the box, or between it and the axle; 2d, in so constructing the composition bearing of the box and other parts connected with it, as to readily admit of the removal of said bearing at any time after it may have become heated or injured."

Claim.—"What I claim as my invention, is the movable plate and aperture made through the front of the box, in combination with one another, and the composition bearing and enclosing case, and made to operate substantially as set forth."

35. For an *Improvement in Cider Mills;* Nathan Chapin, Cortlandtville, Cortlandt county, New York, November 21.

The patentee says,—"The nature of my invention consists in causing the pummice to be subjected to the action of an additional set of crushing cylinders, arranged in an oblong box, having a perforated plate on its bottom through which the cider descends, for thoroughly extracting the cider from the same, and thus dispensing with the use of the ordinary press employed for that purpose, and combining with the box containing the crushing cylinders, a strainer or filter for separating the cider from the pummice and other impurities."

Claim.—"What I claim as my invention, is, 1st, subjecting the pummice to the crushing operation of an additional set of crushing cylinders, geared to, and meshing with, those that first receive and crush the apples, said additional cogged cylinders acting as dischargers, for discharging the pummice after the cider has been extracted, through openings in the sides of the box containing the crushing cylinders, whilst the cider is caused to descend through a perforated plate and the bottom of the box, into a receiver placed below the same, the aforesaid arrangement and use of said crushing cylinders and perforated plate enabling the farmer to dispense with the ordinary press, the crushing, pressing, and separating operations being performed substantially in this machine."

36. For an *Improvement in the Jacquard Machine;* Henry Kelley, Manayunk, Philadelphia county, Pennsylvania, November 28.

Claim.—"What I claim as my invention, is the combination, application, and use of the round cylinder, with pins or screws in its surface, and cogged wheel on its end, (to operate in lieu of the four-sided cylinder or axis and its four-cogged wheel, and of the said cards,) together with the combination, application, and use of the said two pairs of racks, with a pinion working in and between the racks of each pair, all combined, applied, used, and adapted to the jacquard machine, as set forth."

37. For an *Improvement in Razor Straps;* Charles L. Fowle, Boston, Suffolk county, Massachusetts, November 28.

Claim.—"What I claim as new, is a combination made up of the following elements or their mechanical equivalents, viz. the double concave piece, the screw block, the screw, and the endless band, the whole being applied together and used as set forth."

38. For an *Improvement in the Jacquard;* William H. Greene, Jr., Schenectady, Schenectady county, New York, November 28.

Claim.—"What I claim as my invention, is the manner in which I have constructed the three trap boards: or in other words, the peculiar manner of arranging the saw splits and holes of the middle and two adjacent trap boards, whereby they may be used in connexion with the series of wires, each of which is constructed with the three eyes."

39. For an *Improvement in the Manufacture of Potatoe Starch;* E. M., J. S. & W. H. Gordon, Woodstock, Grafton county, New Hampshire, November 28.

Claim.—"What we claim as our invention, is the distributing trough, as combined with the subsiding vat, in the manner set forth. We also claim using a shallow subsiding vat, in the manner and for the purpose substantially as set forth, instead of using a deep one, as heretofore."

40. For an *Improvement in Knife Polishers;* Reuben Shaler, Madison, New Haven county, Connecticut, November 28.

Claim.—"What I claim is the apparatus as set forth, for supplying the inward surfaces of leather with the scouring or polishing material used for that purpose, the operation and construction being substantially as set forth."

41. For an *Improvement in Sewing Machines;* John A. Bradshaw, Lowell, Middlesex county, Massachusetts, November 28.

Claim.—"What I claim as my invention, is 1st, the combination of the rubber or friction plate, helical spring, and bobbin, with the case, as set forth, for producing the required degree of tension in the thread whilst being unwound from the bobbin, substantially as set forth.

"2d, I likewise claim the peculiar construction of the flying bobbin case, carrying the second thread, as set forth."

42. For an *Improvement in Cooking Stoves;* Leonard B. Field, West Sparta, Livingston county, New York, November 28.

Claim.—"What I claim as my invention, is the location of the oven by the side of the fire chamber of the flue space, past the rear end, and along the side of the oven to the smoke pipe, substantially in the manner and for the purpose set forth."

43. For an *Improvement in Mills for Grinding;* David Paddock, Pontiac, Oakland county, Michigan, November 28.

The patentee says,—"The nature of my invention consists in providing the runner or upper stone with funnels and tubes, so constructed and arranged as to gather and force between the bed stone and the runner currents of cool air, by the motion of the runner in grinding."

Claim.—"What I claim as my invention, is the concentrating and throwing between mill stones currents of cool air, by means of the action of the runner or upper stone, and funnels and tubes affixed to, or inserted in, the stone."

44. For an *Improvement in Sausage Stuffers;* Seneca S. Jones, Leicester, Livingston county, New York, November 28.

Claim.—"What I claim as my invention, is the construction and application of the grooves or other similar passages, to form ventilators or air escapes from the case, as set forth."

45. For an *Improvement in Machinery for Making Wooden Pegs;* Henry P. Westcott, Seneca Falls, Seneca county, New York, November 28.

The patentee says,—"The nature of my invention consists in providing cutters or punches, used in making wooden pins, with sockets so arranged as to point the pins at the same time that they are cut, and dislodge them from the machine."

Claim.—"What I claim as my invention, is the combination of pointing sockets, as set forth, with cutting punches, (used in making wooden pins,) in such a manner that they will point the pins at the same time that they are forced through the punches, and afterward dislodge them from the machine, the whole constructed and operating substantially as set forth."

List of American Patents which issued in the month of December, 1848, *with Exemplifications*, *by* Charles M. Keller, *late Chief Examiner of Patents in the U. S. Patent Office.*

1. For an *Improvement in Composition for the Pastel Vat*, *to be used in Dyeing;* Horatio N. Barrow, East Windsor, Hartford county, Connecticut, December 5.

Claim.—"I claim the composition or vegetable preparation of carrot or parsnip sprouts, made substantially as set forth, and used for the purpose mentioned."

2. For an *Improvement in Grinding Card Teeth;* George Emerson, Dyersville, Providence county, Rhode Island, December 5.

Claim.—"What I claim as my invention, is the combination of the sun and planet gearing, consisting of four cog wheels, with the hollow shaft, double threaded screw, and crescent-shaped piece of iron, by means of which a rotary and traversing motion of the grinding wheel is obtained, the whole being arranged and operated substantially as set forth."

3. For an *Improvement in Gun Harpoons;* Oliver Allen, Norwich, New London county, Connecticut, December 5.

Claim.—"What I claim as my invention, is the combination and arrangement of parts constituting the gun harpoon, or a harpoon calculated to carry or be attached to a line, and be discharged from a gun by the explosion of the charge thereof: or, in other words, I claim the specified combination and arrangement of the barbed head and shank with the button, the crossed strips, and the short cylinder. The peculiar arrangement of the button, with respect to the other parts, enables the line to be fixed to the harpoon at such part of it as will prevent it (the said line) from exercising, during the flight of the instrument, any action calculated to injuriously affect the straight course thereof."

4. For an *Improvement in Smoothing Irons;* Mary Ann B. Cook, Boston, Suffolk county, Massachusetts, December 5.

Claim.—"What I claim as my invention, is an organization or combination of elementary improvements, consisting of the rounded bevel of the lower or anterior part of the instrument, the increased weight of the anterior part over the posterior part, and lastly, the rearward pitch of the handle, as set forth; the said peculiar inclination of the handle being to prevent unpleasant strain upon the hand and wrist, and for other purposes."

5. For an *Improvement in Rock Drillers;* John T. Foster and Lyman R. Bailey, City of New York, December 5.

The patentees say,—"The nature of our invention consists in providing a frame of metal, or any other material most convenient, and said frame made with an arch on it, in which is a curved groove or slot, in the which is a curved sliding box attached to a drill stock, by which a spindle and chisel can be made to drill holes in rocks at any angle, and made to operate horizontally or perpendicularly; and also in employing a percussive and reactive force to the operation of drilling, by combining a spiral spring with the drill stock and spindle, and operating the same by a cam fixed on an axle of one or two power wheels, by the which contrivance a force is brought to bear upon the drilling of rocks in a far more effectual and economical manner than any heretofore known. The nature of this invention also consists in the peculiar feeding gear, as it is technically termed, by which the drill is allowed to exert the full force applied without jarring the machinery of the machine, so as to prevent the breaking of chisels. The nature of this invention also consists in having adjustable legs attached to the frame of the machine, to accommodate it to uneven ground on which to stand, and also in providing a jointed curved chisel, to excavate a greater diameter of bore at the bottom of holes, for the purpose of more effectual explosions than by the present known plan for this purpose."

Claim.—"What we claim as new, is the combination of the arch with the sliding box or drill stock bearings, moving in a circular or curved groove, whereby the drill stock is moved to any angle of the said arch for the purpose set forth. We also claim the combination of the collar with the drill stock and spindle, by the pawls, and the pinion, and the pallets, and for the purpose of feeding and changing gear, as set forth."

6. For an *Improvement in Billiard Table Cushions;* Abraham Bassford, City of New York, December 5.

Claim.—"What I claim as my invention, is the application of air or gas confined in a tube of india rubber, or other elastic material, to form the cushion of a billiard table or bagatelle table. I also claim the mode of extending the tube that contains the air or gas in one length around the table, in consequence of which the cushions (tubes) on a table may be inflated at the same time with one air pump, by which the cushions are inflated equally in every part, and by which every point receives the same elasticity."

7. For an *Improvement in Car Wheels;* Lyman Kinsley, assignee of James M. Cook, Canton, Norfolk county, Massachusetts, December 5.

Claim,—"What I claim as my invention, is the manner of making a cast metal chilled tread wheel, having two side plates united to the hub and rim, by the process of founding, the same consisting in making both the plates concave from the hub to the rim, whereby the core can be suffered to remain in the wheel while in the act of cooling, and the advantage of a slow reduction of temperature secured thereby; the said slow reduction of temperature permits the particles of the iron to so adjust themselves as to equally diffuse the various contractile strains; besides, the metal is more or less toughened and annealed by the process of slow cooling."

8. For an *Improvement in Stove Flues;* W. E. Bleecker and S. D. Vose, Albany, New York, December 5.

The patentees say,—"The invention and improvement, consists in the mode or arrangement of flues for accomplishing the following objects, viz. equal distribution of heat, increase of draft, and protection of the flue space from cold air."

Claim.—"What we claim as our invention, is the combination of the two conveying flues with a return flue underneath them, formed by a converging and diverging plate in cooking stoves, as set forth."

9. For an *Improvement in Plates for the Boiler Holes of Cooking Stoves;* Geo. E. Waring, Stamford, Fairfield county, Connecticut, December 5.

Claim,—"What I claim as my invention, is making the division piece part of a contracting ring, as set forth, that it may be reversed from side to side, whereby I am enabled to divide the long boiler hole into two, one small and one large, the large one being of greater diameter than could be found with the usual division piece in the middle, as set forth."

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10. For an *Improvement in Hand Cultivators;* E. E. Hawley, Middletown, Middlesex county, Connecticut, December 5.

The patentee says,—"The nature of my invention consists in constructing and arranging a wheel cultivator, to be used by hand, to serve all the purposes of hand hoeing."

Claim.—"What I claim as new, is the tiller, constructed as described, consisting of a frame containing the tilling implements, in combination with the wheels and axle, propelling handle, and guiding brace, the whole constructed and arranged as set forth."

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11. For an *Improvement in Copying Surfaces by Electricity;* Alex. Bain, London, England, December 5; patented in England, May 27, 1843.

Claim.—"What I claim as my invention, is the copying of surfaces by the electric current through a single circuit of conductors, as set forth. I claim the exclusive right to the use of prussiate of potass, as the most useful ingredient in solutions of chemical compounds, for preparing paper to receive marks formed by the action of electric currents thereon, for telegraphic purposes."

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12. For an *Improvement in Warming and Ventilating Buildings, &c.;* Henry Ruttan, Coburg, New Castle district, Canada, December, 5; Canadian patent dated 23d June, 1848.

Claim.—"What I claim as my invention, is the mode of warming and ventilating buildings, the same consisting in introducing the air from without, at some point sufficiently above the ground to get a pure air, and sufficiently low down to get clear of smoke, said air to be introduced by being conducted under the floor of the building, and directly under the furnace or stove, for the purpose of supplying air to be warmed for distribution, and after being thus warmed, rising in a central or otherwise convenient apartment or passage, and thence carried into the various rooms, by openings in the walls at the upper part or near the ceilings, without the aid of pipes, and thence downwards, through suitable openings in the lower part of the room, and thence outward through the various channels provided, connected with the foul air flue or chimney. I claim also, in the air-warming furnace, the arrangement of the radiating pipes or flues, in combination with the fire chamber, situated within or between them in the manner set forth; and, in combination with the elevated air chamber and flues, I claim the arrangement of the openings for admitting heated air above the fire to complete the combustion, as set forth. I claim the mode of constructing the grate, viz., of raising one or more cylindrical grates above the grate floor, said raised grates being capped or covered in such manner as to protect the vertical bars from the fuel, substantially as set forth. I also claim the mode of conducting the air into my pure air shafts whatever may be the direction of the wind, viz., by placing the swinging valve or shutter at the mouth of said shafts, substantially as set forth."

13. For an *Improvement in Breaking and Kneading Dough;* James Cole, Cincinnati, Hamilton county, Ohio, December 12.

Claim.—"What I claim as my invention, is the elevating apron that passes around the rollers, in combination with the kneading or breaking rollers, substantially as set forth, for the purpose of carrying the dough back to the table after it has passed between the kneading rollers, as set forth."

14. For an *Improvement in Ice Cream Freezers;* H. B. Masser, Sunbury, Northumberland county, Pennsylvania, December 12.

The patentee says,—"My invention consists of constructing a freezer so as to revolve a dasher within it, and also at the same time to turn the freezer in an opposite direction within the ice box; and I form the spindle of the dasher large and hollow, for the purpose of containing ice."

Claim.—"What I claim as my invention, is the forming the spindle of the beater, within the freezer, hollow, so as to be filled with ice, for the more expeditious freezing of the cream, and, in combination therewith, the construction and arrangement of the freezer and beater, substantially in the manner set forth."

15. For an *Improvement in Railway Car Couplings;* Daniel R. Pratt, Worcester, Massachusetts, December 12.

Claim.—"What I claim as my invention, is the combination of the hooks, mortised draw bars, buffers, with the open link, made, arranged, and operated in the manner and for the purpose set forth."

16. For an *Improvement in Chimney Caps;* Felix A. Finn, City of New York, December 12.

Claim.—"What I claim as my invention, is curving the partition in manner substantially as set forth, in combination with the lateral openings and wings in the sides of the chimney caps, as set forth, that blasts of wind blowing in through the lateral apertures may tend to exhaust the flue and aid the draught, and by means of which, also, downward blasts of wind shall be prevented from passing down the chimney flue as set forth."

17. For an *Improvement in Escapements for Chronometers;* Victor Giraud, City of New York, December 12.

Claim.—"What I claim as my invention, is, 1st, the detached or independent detent, formed substantially as set forth, to give a back movement to the scapement wheel in detaching the scapement, when combined with the scape wheel and balance, substantially as set forth, whereby the impulse given to the balance by the scape wheel operates the detached detent, which, in effecting the detachment, has to force back the scape wheel, thus making the amount of resistance of the scapement proportionate to the propelling force of the movement, as set forth. And I also claim the detached detent with two or more faces of repose, against which the teeth of the scape wheel rest, and corresponding recesses of scapement, substantially as set forth, when combined with the scape wheel and balance, whereby the detent in its operations rotates by an intermitting motion, as set forth, thus avoiding the back motion due to a reciprocating detent."

18. For an *Improvement in Spinning;* Wendell Wright, Cincinnati, Hamilton county, Ohio, December 12.

Claim.—"What I claim as my invention, is the employment of the spiral-threaded box, in combination with the rollers for drawing the roving, in the manner set forth, the motion being more perfect and regular than can be effected in any other way."

19. For an *Improvement in Franklin Stoves;* Nathaniel Cradit, Ripley, Brown county, Ohio, December 12.

Claim.—"What I claim as my invention, is the combination of the draft and damper plate with Franklin stoves provided with a notched groove to receive the same, as set forth."

20. For an *Improvement in the Scoop and Elevator;* Ephraim Morris, City of New York, December 12.

Claim.—"What I claim as my invention, is the application of the two-part scoop at the lower end of the frame, conjointly with the arrangement by which the toggle-joint arms close the scoops to load, when acted on by the rope or chain, which afterwards raises the scoops and load, and through which arrangement the same parts open the scoop to discharge the load, when acted on by the rope or chain, both the chains or ropes operating on the toggle-joint arms through the shafts and drums, substantially in the manner set forth."

21. For an *Improvement in Cooking Stoves;* Darius Buck, Albany, New York, December 12.

The patentee says,—"The nature of my invention consists, first, in the arrangement of the two ovens, one, that is the main one, at the back of the fire place, and extending, if desired, partly under it, and the other in front of the main one, extending under the open hearth, with an arrangement of flues by which the draft is caused to pass over the main oven, down two side flues at the back, along two side flues at the bottom, then uniting in a single flue under the front oven, up in front thereof, over the top, and between it and the open hearth, then down a diving flue between the two ovens, to a return flue under the main oven, and between the two side flues, and thence up through a middle flue at the back to a chimney, the said central return flue at the bottom of the main oven being provided with a sliding damper, which, when open, permits the draft, after passing through the two main flues at the bottom, to enter and pass through the said return flue to the chimney, without passing around the front oven, so that, by means of the sliding damper, both ovens or only the main one may be heated. And the second part of my invention consists in making hot air chambers between the central and the two side flues at the back, and the two main and the return flues at the bottom, by making the partitions double: that is, of two plates, when this is combined with apertures through the bottom and back plates of the stove, for the free admission of air to be heated in these chambers, to aid in baking."

Claim.—"What I claim as my invention, is, 1st, the arrangement of the two ovens, one in front of the other in combination with the arrangement of flues, by which the draft can be made to pass over the main oven, down the back in the two diving flues, along the bottom, up the front of the front oven, over the top of it, down the diving flue between the front and main oven to the return flue, along the bottom and up the back of the main oven to the chimney, substantially as set forth. And I also claim, in combination with the arrangement of ovens and flues, the employment of the damper in the central return flue at the bottom, for the purpose of causing the draft to pass around one or both of the ovens at pleasure, substantially as set forth."

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22. For an *Improvement in Parlor Stoves;* George E. Waring, Stamford, Fairfield county, Connecticut, December 12.

Claim.—"What I claim as my invention, is making the apertures in the cap plate, for the draft, mainly in the front part thereof: that is, over that part of the ash pan which passes through the radiating cylinder, to distribute equally the draft and the radiation of heat thereby produced."

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23. For an *Improvement in Bell Telegraphs;* Jacob G. Day, Brooklyn, New York, December 19.

Claim.—"What I claim as new, is the parts and arrangement set forth, by which the spring slides and their latches co-operate with the slides and cams, and move the words, signs, or numbers, into place, to be seen as required, and strike the bell through their operation on the rock shaft and toe, and also allow any subsequent blow on the bell to be given by the same, or any other slides, while the previous sign, word, or number, remains in place to be seen, and to indicate that fact by the intermittent or snatching motion caused by the limited movement of the notch next the cam, on the pieces or wedge, including the means of returning the signs into the spaces between their proper openings, by the counter slides or frame."

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24. For an *Improvement in an Apparatus for Drawing and Measuring Liquids;* John H. Hecker, Hinckleton, Lancaster county, Pennsylvania, December 19.

The patentee says,—"The nature of my invention consists in forming, in the tubes through which the liquid flows from the cask to the measure, a segment chamber containing a valve, which is moved up and down, to let on or stop off the flow of the liquid as required, by means of levers, springs, suspended float, and other mechanical contrivances, so combined and arranged, in relation to the valve, as to close said valve and stop off the flow of the liquid from the cask, without the aid of an attendant, by the rising of the liquid in the measure acting on the float, causing the fastening (holding the valve open) to be detached from the lever to which the valve is secured, and allowing the valve to be forced down by a spring pressing against said lever. And also, in combining with the apparatus an alarm bell, which is caused to strike when the valve is closed, in order to call the attention of the attendant to the fact."

Claim.—"What I claim as my invention, is the mode of measuring liquids by means of the combination of the measure, tubes, valve, lever, hinged bar, catch, roller, springs, cord, and float, arranged and operated as set forth. I also claim the combination of the alarm with the measuring apparatus, by means of the lever and chain, for giving notice when the measure is filled and the valve or gate is shut, as set forth."

25. For an improvement in *Furnaces for heating Sad Irons;* Reuben Smith, assignee of Samuel Maxam, Westfield, Hampden county, Massachusetts, December 19.

The patentee says,—"The nature of my improvement consists in the combination of a pyramidal casing, with a cylindrical furnace pot, resting upon a circular plate, and the flat irons are heated by being placed in the several openings in the said pyramidal casing."

Claim.—"What I claim as my invention, is the combining with a furnace pot the pyramidal casing, provided with perforations to receive the flat irons, in the manner set forth."

26. For an *Improvement tn the Machine for Cutting Paper Fringe;* Peter and George Pengeot, Buffalo, Erie county, New York, December 19.

Claim.—"What we claim as our invention, is the form of the blades, by the addition of the parts which we have denominated clearing teeth, to be inserted in the same, as set forth."

27. For an *Improvement in Ploughs;* Neri Blatchley, Windsor, Brown county, New York, December 19.

Claim.—"What I claim as my invention, is removing earthy and other adherent obstructions from the surface of the mouldboard of the plough by means of a scraper, mounted upon a spring lever, which renders it self-acting, and which may also be operated by a string, one end of which is attached to either the lever or scraper, and the other held in the hand of the ploughman; the several parts being constructed and operated substantially as set forth."

28. For an *Improvement in Machinery for Boring Brush Blocks;* S. Taylor and A. R. Davis, East Cambridge, Middlesex county, Massachusetts, December 19.

Claim.—"What we claim as our invention, is the machine or combination for boring brush blocks; the combination consisting of the series of revolving bitts, the index rod, or pointer, the revolving pattern holder, patterns, block holders, and geer wheels, applied to the lay beam, sustained by universal joints, as set forth; together with the lay bar and other mechanism for forcing the lay beam and blocks and pattern forwards against the bitts, as set forth. And as auxiliary thereto, we claim to make the lay beam moveable transversely in such manner in order to cause the bitts to pass through the blocks in directions at such angles with the front face of each of them as may be desirable to produce a proper spreading or flaring of the several bunches of bristles which may be inserted in them."

29. For an *Improvement in Horse Collar Blocks;* William H. Bustin, Watertown, Middlesex county, Massachusetts, December 19.

The patentee says,—"It will be seen that I do not claim the rim or groove for stretching the roll of the collar simply, but that as I so form the block that the collar would have a tendency to slip off while being stretched, the rim or groove becomes essential to preserve it in position, or hold it on the block. It is, therefore, for *such purpose* that I claim the rim or groove, in combination with the swell, or that part of the block from which the collar would have a tendency to rise, in the act of being formed and stretched."

30. For an *Improvement in the Sash Bearer and Fastener;* Ira Glynn, Syracuse, Onondaga county, New York, December 19.

Claim.—"What I claim as my invention, is the fastening window sash frames when closed, and retaining them in different positions when open, by means of the long and short levers with the catches, at their extremities, the springs, and thumb lever, combined and arranged with each other, and with the mortises in the sides of the sash frames, in such a manner that the thumb lever cannot be moved to disengage the fastening apparatus without first slightly elevating the sash frames, in the manner set forth."

31. For an *Improvement in the method of employing Water used for Condensing Steam as a Motive Power;* Joseph P. Pirsson, New York city, December 19.

The patentee says,—"The nature of my invention consists in the application of the water used for condensing the steam of a steam engine, as a motive power, for the purpose of adding to the power of the main engine, or for the propulsion of independent machinery, as may be desired.

Claim.—"What I claim as my invention, is the employment of the injection water used for condensing the steam of a condensing steam engine, as a motive power. I also claim the peculiar manner set forth, in which the force thus obtained can be applied to the propulsion of machinery.

32. For an *Improvement in the Manufacture of Ichthyocolla;* Ebenezer Rowe, Rockport, Essex county, Massachusetts, December 19.

Claim.—I claim the means set forth of cooling each of the cylinders, viz: by the induction and eduction tubes placed at one end of the cylinder, and making the induction tube to extend through the eduction tube and the middle of the cylinder, and nearly to the other end of it, as set forth."

33. For an *Improvement in the method of Preserving the Shape of Steel Springs in the process of Tempering them;* David M. Smith, Springfield, Windsor county, Vermont, December 19.

Claim.—"What I claim, and as particularly applicable to the manufacture of curved flat springs, for trusses or for various other articles, is, 1st, the process, consisting of hardening the spring in the usual manner, when off the mould; 2d, in drawing the temper, (it being still off the mould,) to such extent as to enable me to apply it to the mould without danger of breaking it while so doing; 3d, in clamping said spring to a mould, and plunging it and the mould so clamped together into a bath of melted lead, or other suitable metal, or material or materials in a fluid state, and raised to the temperature necessary to produce the desired effect of preserving the shape of the spring, or that given to it by the mould.

34. For an *Improvement in Machinery for Turning Irregular Shapes;* Allen Goodman, Dana, Worcester county, Massachusetts, December 19.

Claim.—"What I claim as my invention, is the combination of the governor with the vibrating rest, cutters, and mandrils, for the purpose of turning irregular forms, whether the same be constructed and arranged as set forth, or in any other manner.

35. For an *Improvement in the Plough;* David B. Haight, Perryville, Madison county, New York, December 26.

The patentee says,—"The nature of my invention and improvement consists in attaching the beam to the parts with which it is connected, in such a manner that its front end can be raised, lowered, and moved to the right or left, and held there for the purpose of assisting properly the point of draught; also in attaching the point to the mould-board without bolts or loops, and in fixing a removable shoe or guard to the land-side, which can be removed as often as it becomes too much worn to perform its office properly, whereby the land-side is effectually protected from injury, and rendered as durable as any other part of the plough."

Claim.—"What I claim as my invention, is interlocking the share and mould-board together, by means of a tapering dovetailed tongue, formed on the former, which enters a similarly shaped groove made in the latter."

36. For an *Improvement in the Corn Sheller;* Waldren Beach, city of Baltimore, Maryland, December 26.

The patentee says,—"The nature of my invention and improvement consists in constructing the slides with turned-up lips or radial strippers, of the expansive corn sheller, of such a form that the upper strippers will overlap and break the joints between the lowers strippers, and thus form a continuous edge in the upper end of the hole through which the cob is driven, to strip the corn from it, whether the hole be expanded, as in driving a large cob through it, or contracted, as in driving a small one."

Claim.—"What I claim as my invention, is forming and arranging the teeth slides with turned-up lips, for stripping the corn from the cob, called strippers, so that the vertical joints between one pair of opposite strippers shall be broken and covered by the other pair, in all positions of the same, whether collapsed to form the smallest, or expanded to form the largest hole, or at any intermediate point."

37. For a *Machine for Turning Chair Legs, &c.;* Russell D. Bartlett, Harmony, Somerset county, Maine, December 26.

Claim.—"What I claim as my invention, is the combination of two rotary mandrils and one cutting knife, (or its equivalent,) as arranged, and made to operate together. And I claim, in combination with the said two rotary mandrils and cutting knife, or machinery, for rotating and reducing the wood, the two sets of bearers and cam bars, or cams. And I claim, in combination with the connecting bar of the lever, the two foot levers."

38. For an *Improved Door Latch;* Robert J. Fry, District of Spring Garden, Philadelphia county, Pennsylvania, December 26.

The patentee says,—"The machine is a *door-holder*, intended to retain the hinged door, blind, shutter, lid, &c., in the position given by the operator. It keeps the door just where the operator places it after a pull or push upon the door itself, either with his hand or any other part of his body."

Claim.—"What I claim as my invention, is a double oblique catch, or holder, acted upon by a spring, in combination with the latch hook, or the edge of a door, shutter, or other hinged article, constructed and operating as above described; not intending in these claims to restrict myself to the arrangement herein described, but to vary the same at pleasure, while I attain the same end by means substantially the same."

39. For an *Improvement in the Piano Forte Action;* John H. Low, Boston, Suffolk county, Massachusetts, December 26.

The patentee says,—"The improvements which I have made consist, first, in the peculiar construction of that end of the hammer lever in which the fulcrum, or pivot, is placed, so that when the hammer is at its greatest height, or in contact with the strings, the point where the power is communicated from the key lever, and the fulcrum, or pivot, on which the hammer lever turns, shall be in a horizontal line, or nearly so, in connexion with an opening, or notch, between these two points, sufficient to admit the head of the jack, or fly, by which the power is communicated, allowing the jack, or fly, to work off by its own regular motion, produced by being firmly attached to the key lever, and describing a circle, of which the fulcrum of the key lever is the centre. Secondly, in forming a rest, to prevent the jack, or fly, from moving more than is necessary to allow the hammer to fall upon the back catch, thereby avoiding the noise that is sometimes produced by the rebounding of the fly upon the surface, where it should slide smoothly."

Claim.—"What I claim as combined together, and with the hammer and fly, is the projection, and peculiar recess, with its abutment, or block."

40. For a *Machine for Forming, by Compression, Prismate Heads on Metallic Bolts;* William Grant, Boston, Suffolk county, Massachusetts, December 26.

Claim.—"What I claim as my invention, is the formation of heads on bolts by machinery, by first upsetting or compressing into a partially closed die a portion of the rod, by means of a punch, into a shape approximating to the form required, but of larger diameter, and proportionately shorter, and then by entirely closing the dies, and again forcing up the punch, reducing it to its proper proportions, and completing its form, whether the devices by which the several motions are produced be such as are herein described, or others capable of effecting the same results."

41. For an *Improvement in Cooking Stoves;* Lysander A. Orcutt, Albany, Albany county, New York, December 26.

The patentee says,—"The nature of my invention, consists in substituting in cooking stoves an open Franklin fire-place, in lieu of the usual close fire-chamber, (said open fire-place, however, being so arranged as to be capable of being converted at pleasure into a close fire-chamber,) and also in a new arrangement of flues and apertures to create a current of hot air through the oven, to carry off the moisture, &c., generated in the act of baking."

Claim.—"What I claim as my invention, is the introduction of heated air from the vacuity between the two plates at the back of the fire-place into the upper part of the oven, by means of a pipe, or pipes, which pass through the front flue, in combination with the exit passage situated at or near the bottom of the oven, and the small flues operating as herein described."

42. For an *Improvement in Casting Metal Pipes;* Thomas J. Lovegroove, Baltimore, Baltimore county, Maryland, December 26.

Claim.—"What I claim as my invention, is forming pipes of cast iron, or other suitable metal, by causing the mould in which the metal is poured to revolve with a velocity sufficient to cause the metal to assume a tubular form around the inside of the mould, without the employment of a core."

43. For an *Improved method of Sawing out Spokes, Staves, &c.;* Thomas Green, De Witt, Onondaga county, New York, December 26.

The patentee says,—"The nature of my invention consists in sawing with the grain either straight-grained or winding timber, in such manner as to make the spoke, or other article sawed out, straight and not cross-grained, without waste of timber.

Claim.—"What I claim as my invention, is the placing the bolt and arranging the operation so that I saw with the grain straight-grained or winding timber, and make the spoke, or other article sawed, straight, and not cross-grained, without wasting the timber."

44. For an *Improved Piano Forte Action;* John J. Wise, Baltimore, Baltimore county, Maryland, December 26.

Claim.—"What I claim as my invention, is, 1st, the application of springs attached to a movable bar, or rail, to the key levers of the piano forte, so as to impress different degrees of force; 2d, I also claim the combination and arrangement of the turning rail, lever, and notched plate, for the purpose of graduating the force of the springs on the key levers, in order to adjust the keys for various degrees of touch, and to the physical capacity of the performer, and to the character of the music to be played. I likewise claim as my invention, attaching the "*check*" to the "*under hammer*," (instead of the end of the key lever, or to an additional lever,) by extending the "*under hammer*" beyond the "*main hammer*," so as to receive the "*check-piece*" which I attach to it in any convenient way, by which arrangement the reaction of the main hammer upon the key lever is prevented."

45. For an *Improvement in Hot Air Stoves;* T. H. Parker, York, York county, Pennsylvania, December 26.

Claim.—"What I claim as my invention, is, 1st, the swivel cap, constructed, arranged, and combined with the stove; 2dly, I claim the double revolving grate, in combination with the close base. I also claim the combination of the horizontal flue with the stove."

Woodworth's Planing Machine.

Opinion delivered by Judge Kane, *in the United States Circuit Court of the Eastern District of Pennsylvania, in the case of Wilson* v. *Barnum, on a motion for an interlocutory injunction for an infringement of a patent for Woodworth's Planing Machine, May* 31, 1849.*

A motion is made in this case for an interlocutory injuction, to restrain the defendant from further using a machine, which, it is said, infringes upon the complainant's rights under the Woodworth patent. The defendant does not contest the validity of that patent, but he denies that he has infringed it by using the machine complained of, which he asserts to be an independent invention, and as such secured to him by letters patent, recently issued under the act of 1836.

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* From the Philadelphia Evening Bulletin, of June 4, 1849.

The preliminary question is thereupon made by the defendant, whether a patent issued under this act of Congress must not, for the purposes of the present motion, be regarded as controling evidence of title in favor of the party claiming under it.

There are certainly cases under the present patent laws in which the court would enter very reluctantly upon the discussion of the validity of a patent. Some of the provisions of the act of 1836 give a quasi-judicial character to the action of the Commissioner; and it has accordingly been held, I believe generally as well as justly, that the patent itself is to be taken as prima facie evidence of the novelty and usefulness of the invention specified in it.

There are other cases in which the official action of the patent office claims properly a still higher degree of consideration. Wherever antagonist patentees or third persons generally have been first called in, it is reasonable to consider that action as a preliminary adjudication upon their rights. And this for the obvious reason, that they have been parties, or but for their own default might have been parties, to the proceeding on which the adjudication was based.

But this is the limit, beyond which comity cannot be required to go. It cannot be asked that a third person shall have his legal rights impaired, or his legal remedies impeded, by any proceeding to which he was not, and could not have made himself, a party. To hold ourselves concluded by the action of the patent office, where that action has been without notice, would be as perilous to the interest of inventors as to that of the public. We have had in our own court one case at least, in which an injunction was sought against the real inventor, on the faith of a patent granted to a surreptitious claimant. The grant of a patent to the defendant, therefore, can have no other effect on the present discussion, than as it indicates the opinion which highly respectable and skilful officers have formed on an ex-parte examination of the case.

We come, then, to the principal question: does the machine now in use by the defendant embody the principle of the complainant's patent?

The judicial definition of a patent, or of the principle it involves, in a case under trial, is properly, if not necessarily, a limited one. It regards primarily, and as a matter of course, the circumstances of the pending controversy. The identity or the difference between the two machines is sought in the first place by a comparison of them, either in their elements or as a system; and we are commonly said to define their mechanical principles, when, after making such a comparison, we indicate the essential particulars in which they are alike or otherwise. A new comparison of the patented machine with another not before the subject of adjudication, as it presents new points of similarity or variance, calls for a different expression of the principle of the patent. The aspect of the invention changes as we approach it in a new direction; and parts become prominent that were subordinate before, and that involve perhaps important relations to the question in dispute.

For this reason the cases upon the Woodworth patent, which are found in the Reports, as well as those which have been determined in this court, give, for the purpose of the present inquiry, an imperfect definition of the principle of the invention. In all of those cases, the machine complained of carried the planks through it on an unvarying plane, which was tangential to the revolving motion of the planing knives, and the planing knives were set on the periphery of the revolver; in both of these particulars resembling the Woodworth machine. In Mr. Barnum's, the cutting tool is set on the face of a rotating disk, and the plank advances in a plane parallel, it is said, with the disk, till the operation of planing is completed, and is then deflected from the machine; thus, at the first glance, differing throughout, as well from the Woodworth machine, as from other machines with which the Woodworth has been compared on former occasions.

What then shall we regard as the principle of the Woodworth invention, when viewing it in connexion with the machine of the defendant? We shall, perhaps, be led to the answer, by tracing the history of this important class of labor-saving machines.

Before the present century, it had been deemed an object of much interest to adapt some combination of machinery to the work of smoothing the surface of boards. The mechanical difficulties in the way were these: 1. That the cutting tools, if made to work parallel to the external surface of the plank, encountering all the sand and grit that adhered to it, soon lost their edge, and became incapable of producing a uniform surface.—2. That if the tools were made to cut otherwise than parallel to the surface, so as to pass *through* the gritty exterior instead of *along* it, the plank would be alternately driven down as the tools struck it, and lifted up as they left it, and would thus have a constant and rapid vibration under the action of the machine.

The engine devised by Mr. Bramah, in 1802, was so contrived as to get rid of the first of these difficulties. His cutting knives were placed on the side or surface of a circular rotating disk; but beyond them, at the extreme periphery, he placed a set of projecting rough cutters, which struck the plank as it advanced in the same plane with the disk, and before it reached the planing knives had removed the outer surface to which the grit adhered. His machine was imperfect, however; for, in consequence of the elasticity of the plank, as well as of the machinery, and the vibration due to the rapid but intermitting action of his tools upon the plank, his cutters, after completing their work, would, as they revolved, come in contact again with the finished surface, and score it irregularly.

Woodworth's machine was the next which I need refer to. He affixed his cutters to the periphery of a revolving cylinder, and advanced the plank towards them, under strong pressure, in a plane tangential to their motion, thus making the cutters describe a curve upwards from the finished surface through the rough surface of the plank, and preventing the plank from vibrating sensibly during the operation. This machine did its work effectively and well. The plank, moving firmly along the tangent plane of the rotating cylinder, passed beyond the reach of the cutters, and was disengaged from the action of the machine at the moment the work was perfected.

This was imitated in the Gay and the MacGregor machines, in which a flattened cone or dished plate wheel was substituted for the cylinder. By this change, the corrugated surface which is left by the Woodworth machine was avoided; the action of the cutters being very nearly in a line parallel to the surface of the plank, and therefore producing shavings instead of the chips which are thrown out by the Woodworth cutters. But as the curve in which the cutters acted became one of a larger circle, the deflexion between it and the plane of the plank's motion was, of course, less rapid than in the Woodworth machine; thus increasing in some degree the liability of the finished part of the plank to receive the same injury from vibration, which was the characteristic defect in the action of the Bramah machine. Nevertheless, when the Gay and MacGregor machines were before this court some three years ago, it was held that they infringed upon the Woodworth principle, inasmuch as they contained the revolving cutter acting upon a plank in the tangent plane of the revolver.

The next machine to be described is that of the defendant. Its appearance is, in many respects, similar to Gay's, though it differs materially in others. It has the Bramah disk, with its two sets of rough and finishing cutters; but the plank is made, by a very ingenious contrivance, to advance along a metallic guide, either in a straight or slightly curved line, till it comes beneath the axis of the disk, when, by a turn in the guide, it is bent outwards over a small roller, and thence passes from the machine in a line similar to that by which it approached it. The finishing cutters begin to act upon the plank in a line very nearly parallel to its surface, and complete their work as the plank turns over the roller.

We have thus a machine that cuts in a right plane upon a curved surface, the revolving disk, at the moment of finishing the work, forming a tangent plane to the curve of the advancing plank. We have, too, a roller, over which the plank is forcibly bent, and which, by its resisting pressure against the elasticity of the plank, holds it steady under the action of the cutters: that is to say, we have a machine just the converse as well as the equivalent of that invented by Woodworth. One general expression may include them both: A planing machine in which the cutters and the material move against each other in a curve and in its tangent plane respectively, the material being kept from vibrating by roller pressure. It is true that, in one machine, it is the cutter which follows the curved path, while the material moves along the plane, and that in the other, the cutter moves in a plane, and the material is acted on in the curve; but there is no other difference.

Is this, then, a difference of principle? Can it be said that the essential character of a machine is varied by a mutual interchange of form and direction between the two elements of which it is a combination, while both object and effect remain as before? Does not the question, in its very terms, suggest Lord Tenterden's illustration in the Percussion Lock case, (Webster, P. C. 128,) of those analogous contrivances, the bringing up of an anvil against the hammer, and the bringing down of the hammer against an anvil?

We may recognize differences of details in the defendant's machine, both as to the means and the effect; and these may properly be patented as improvements upon the Woodworth invention, perhaps highly meritorious ones: but considered as independent combinations, I cannot escape the conclusion that, whether the plank or the cutter have the curvilinear motion, if the other moves in a plane, and the two are made to act and react upon each other, for the same object and with the same effect, the machines are in principle identical.

My only embarrassment in arriving at this conclusion has been owing to the fact that, of the highly educated mechanicians whose affidavits have been taken in the cause, the greater number have expressed a different opinion. The consideration, which was so eloquently pressed in the argument, that the responsibility of deciding this question might with propriety be devolved on a jury, has had no influence with me. That judicial morality might be impeached for infirmity, which could shrink from awarding to a party his remedy after ascertaining his rights. "The right of a party to the most speedy and effectual protection against a meditated wrong is as complete as his right to redress for wrongs already inflicted, and the accident of position confers no right on one party, whether he be plaintiff or defendant, at the expense of the other. The special injunction of equity, like the arrest on mesne process at law, may be abused to the injury of an opponent; but it is no less on that account the duty of the Judge to further them both, when, in the exercise of his best discretion, he believes that they are called for by the merits and the exigency." This was the language of the court when this patent was before us formerly, and my experience since has not taught me that it ought to be modified. The preventive interposition of equity is very often the only effective resort of a meritorious patentee; and where the facts of the case are not controverted, I am by no means satisfied that it is not the safest for both parties.

There is no conflict of evidence here: the question is of deduction and opinion. Were the case at this time under trial at bar, it would be the office of the judge to interpret the specification and define the principle of the invention. This is the only point of difficulty, and it must be encountered by the judge, whether he sits on one side or the other of the court.

To send the cause to a jury would be to delay its adjudication for many months; leaving the complainant, in the meantime, with his legal rights suspended, and swelling the measure of the defendant's ultimate liabilites. I should do injustice to both parties, were I, with my present views of the merits of this controversy, to refuse the injunction.

Interlocutory injunction awarded till hearing or further order.

For the complainant, Mr. St. Geo. T. Campbell, Mr. W. H. Seward, of New York. For the defendant, Mr. W. L. Hirst, Mr. Stoughton, of New York.

SPECIFICATIONS OF ENGLISH PATENTS.

Specification of the Patent granted to Alexander Angus Croll, *of the County of Middlesex, for Improvements in the Manufacture of Gas, and in Apparatus to be used in Transmitting Gas.*—Sealed August 22, 1848.

My invention consists,

First, of improvements in setting retorts and apparatus for making gas from coal.

Secondly, my invention consists of a mode of employing steam passed through highly heated carbon, and then mixing with carburetted hydrogen as it is distilled from coal.

Thirdly, my invention consists of so employing sulphurous acid gas as to combine with sulphuretted hydrogen gas, and to cause the sulphur of the gases to be thrown down or precipitated.

Fourthly, my invention consists of improvements in apparatus to be used in transmitting gas. And in order that my invention may be most fully understood and readily carried into practice, I will proceed to describe the means pursued by me.

It has heretofore been proposed to employ long retorts capable of being fed at each end, and in such manner that the products of gas from the last charge shall pass over the charge which has been for a length of time in the retort, for which purpose each such retort was provided with a rising-pipe at each end, to carry off the gas evolved first from one end of the retort, and then at the other, the different ends of each retort being fed at distinct intervals, so that the two charges therein will at all times be in a different state of process, one charge being comparatively fresh whilst the other charge will be comparatively spent.

Now the first part of my invention consists of using similar retorts, that is, retorts which can be fed at each end, but in place of having two rising-pipes, one at each end, as heretofore, for carrying off the produced gas, I have only one rising-pipe, which I apply at one end of a retort, and then, in place of feeding the two ends alternately, and at distant periods one from the other, I charge both ends at the same time, by which arrangement I have found considerable advantage result in the manufacture of gas.

I will now describe the second part of my invention, which has for its object the use of steam passed through carbon at a bright red heat, and then causing it to pass over or amongst the charge of coal which is being distilled in a retort. For this purpose I prefer to use retorts such as above described, and at the end most distant from the rising-pipe I charge the retorts with coke, and have a steam-pipe to convey steam into the retort at that end, and at the other end of the retort I from time to time supply a charge of coal, say at every five hours, and allow steam to flow in for about the first three hours of each charge; and I have found that about fifteen gallons of water evaporated and caused to pass into retorts for each ton of coals, (that is, when Newcastle coal is used, but when Kennel coal is used the quantity should be increased,) produces the most advantageous working, but I do not confine myself to the use of that quantity. The object being to obtain a larger quantity of gas of a fair illuminating power, and a less produce of tar.

I will now describe the third part of my invention, which has for its object the use of sulphurous acid in such manner as to deprive carburetted hydrogen gas of the sulphuretted hydrogen gas with which it is contaminated, and thus to obtain the sulphur of both compounds in the form of flour of sulphur.

I first make a solution of sulphurous acid in water, by connecting a vessel or vessels of cast iron, (arranged as a Woulfe's apparatus used for impregnating liquids or gases,) with an oven or other suitable apparatus for carrying on the combustion of sulphur, and by means of an air-pump or other arrangement for producing a draft, connected with the vessel containing the water or liquid to be impregnated, I cause a current of sulphurous acid gas, from the burning sulphur, to pass through the water or liquid, and by which it is largely absorbed. This I do till the liquid is nearly saturated with sulphurous acid, and to effect this about six ounces of sulphur will require to be burned for every gallon of water.

The sulphurous acid thus made I transfer to the first of a series of three vessels, (or, it may be, other number of vessels,) constructed and arranged exactly in the same manner as the wet-lime purifiers in common use at gas works; the other two vessels are charged with a weaker solution, derived after the process has been once put in operation from the washers to be afterwards mentioned, and by a portion of the sulphurous acid which is disengaged from the first vessel. I charge each of these vessels exactly as is done with the liquid in the wet-lime purifiers, videlicet, so that the gas may pass through and come into extensive contact with the solution of sulphurous acid; and I cause the gas to pass first into the vessel with the strong solution, and thence into the second, and thence again into the third.

In thus passing through these successive purifiers, the sulphuretted hydrogen in the coal gas, and the sulphurous acid, are both decomposed, and sulphur is abundantly deposited. When the sulphurous acid in the first vessel has been all decomposed, or nearly so, the contents must be discharged into a suitable reservoir, where the liquor may settle or be filtered, and the sulphur obtained and dried.

The vessel must then be charged with a new solution, and the process proceed as before. But I prefer in practice, instead of using a separate vessel, as already described, for preparing the solution of sulphurous acid, to use two setts of purifiers alternately, and therein to charge the liquid with sulphurous acid in the one set when the coal gas is being passed through the other, and instead of using fresh water for this purpose, I transfer the liquid already partially charged from the second to the first, and the contents of the third I transfer to the second, as in like manner the third has been charged from the washers now to be described.

I find that, owing to the volatility of the sulphurous acid, a portion of it is carried over with the gas, and, therefore, to free it from this impurity, I cause it to pass through three other vessels, which I call washers; and finally, that every trace of impurity may be removed, I pass it through a common dry-lime purifier. The freedom from impurity may be ascertained at any stage of the process by the usual test of acetate of lead for sulphuretted hydrogen, and by the smell, if there be even a most minute portion of sulphurous acid present.

These washers are arranged so as to be put in connexion with either series of purifiers at pleasure, and any construction may be adopted by which there is a free passage for the gas, and a thorough exposure of it to the water, and for this purpose the ordinary lime purifiers already referred to, answer very well. In the washers these are charged with water only, and as it becomes impure, it is transferred through the series onward, and then into the purifiers, the last vessel of the series being always supplied with the fresh water, and care being taken that it never gets so charged with sulphurous acid as to allow of its being disengaged with the gas. Such is the general mode of procedure, that in practice it is not necessary to discharge or transfer the contents of the purifiers every time they are impregnated with sulphurous acid, but only when the accumulation of sulphur, tar, &c. renders it necessary, and also if more water be required in the washers than it is necessary to transfer to the purifiers, then it may be run out, and, after depositing its sulphur, may go to waste.

I will now describe the fourth part of my invention. It has heretofore been proposed to have gas-holders fixed at a distance from the works in order that they may be near or in the locality where the supply is to be given, and it has been proposed to aid the transmission of gas from the works by means of exhausting apparatus.

Now the fourth part of my invention consists of apparatus similarly arranged to that above mentioned: that is, a gas-holder or gas-holders at a distance from the works, together with exhausting apparatus to take the gas from the main and drive it into the gas-holder or gas-holders near such exhausting apparatus.

And the peculiar character of this part of the invention consists of so working that the gas in the main between the gas-works and the exhauster, in the vicinity of the gas-holder, at a distance, may be maintained at a proper degree of pressure for supplying the intermediate district. For this purpose I cause the exhausting apparatus to be capable of taking the gas to such an extent as to exhaust the gas-main, so that if no provision were made for maintaining the gas at a proper degree of pressure in the main, no supply of gas to the intermediate district could take place from the main. When the exhausting apparatus is at work, I cause there to be a branch-pipe from the main to the gas-holder, such branch-pipe being connected at a point from the gas-holder beyond the exhausting apparatus, and on such branch-pipe I apply a governor, which I prefer to be such as are now used at gas-works to regulate the pressure of gas in the mains. By this arrangement, although the exhausting apparatus will, at all times when at work, be propelling gas into the gas-holder from the gas-main, with a tendency to exhaust the main, a quantity of gas will pass from the gas-holder by the branch-pipe into the main, which quantity will be regulated by the governor, which will thus keep the gas in the gas-main at the desired working pressure, and the gas-holder or gas-holders, at a distance from the works, will only be supplied by the exhausting apparatus with the quantity of gas which would otherwise cause the gas in the main to rise in excess of the desired working pressure.

Having thus described the nature of my invention, and the manner in which the same is to be performed, I would have it understood that I do not confine myself to the details herein described, so long as the peculiar character of any part of my invention be retained,

But what I claim is,

First, The mode of manufacturing gas herein described, whereby retorts capable of being fed or charged at each end are employed, the gas being conveyed off at only one end.

Secondly, I claim the mode of employing steam in the manufacture of gas, as above described.

Thirdly, I claim the purifying coal gas by employing sulphurous acid gas, so as to separate and thus obtain the sulphur in the form of flour of sulphur; and, Fourthly, I claim the mode of arranging apparatus for transmitting gas, as herein described.—[*Inrolled February* 22, 1849.

Lond. Rep. Pat. Inv., April, 1849.

Specification of a Patent granted to William Henry Kempton, *of Pentonville, for improvements in Reflectors and Apparatus for Artificial Light* —Sealed November 7th, 1848.

This invention relates, firstly, to improvements in the manufacture of reflectors, and, secondly, to improvements in apparatus for artificial light.

The improvements in the manufacture of reflectors consist in making them of earthern or pottery ware, and then producing a silver lustre on the surface thereof, in the same manner that such silver lustre has heretofore been produced on tea cups, saucers, and other articles.

The second part of this invention is explained by figs. 1, 2, 3, 4, 5, and 6. Fig. 1 exhibits a reflecting lamp for lighting shop windows from the outside. The advantage resulting from this lamp is its great reflecting power, at small cost compared with plated metal; and the novelty consists in the reflector *a*, which composes the body of the lamp, being made of earthern or pottery ware, and coated on the inside with silver lustre. The construction of the lamp is also simplified and improved, first, by the supply-pipe for the gas being introduced through the chimney of the lamp, and, secondly, by the use of a convex circular glass, inserted into a hinged rim, for the front.

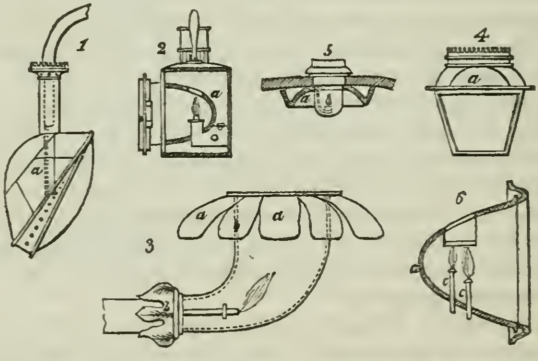


Fig. 2 represents a parabolic railway signal lamp. In this lamp, the case for the reflector and the burner being in one piece, the reflector (which is made of earthenware coated with silver lustre) can be easily attached to the burner, and will not be liable to get out of focus; it will also be less liable to damage from the heat of the lamp; will not be likely to be impaired by change of temperature; and will be altogether a much cheaper article than the plated metal reflector.

Fig. 3 shews what is termed the cornucopiæ light. The patentee says that this is a perfectly original mode of burning gas in glasses—the flame being made to issue horizontally from the burner, instead of vertically; by which plan the shadow from the burner and fittings is thrown back upon the branch, and not upon the table or desk over which it is placed. The air to support combustion is admitted through the leaf *b*. The reflector *a* may be used in combination with the burner and glass, or not, as may be preferred.

Fig. 4 exhibits a street lamp, the top or roof, *a*, of which is to be made of earthen or pottery ware, coated with silver lustre; but in other respects the lamp is of the ordinary description.

Fig. 5 shews a drop roof lamp for railway carriages, combined with a reflector. The lamp may be of any suitable construction. The reflector *a* is fixed to the roof of the carriage, and is made of such a form as to admit of the lamp being dropped through it.

Fig. 6 represents a gas stove. The silver-lustre reflector *a* is made of a parabolic or conical shape, and is to be fixed in the recess of the fire-place, or in an open space; *c c* are the gas-burners. The patentee states that it is also intended that coals or charcoal should be burnt in a grate placed in the focus of a reflector of a parabolic or other shape, and the heat reflected into the apartment. He is aware that it has been before proposed to employ gas for heating rooms; he does not, therefore, claim the same generally, but only the mode of arranging the apparatus with a reflector constructed according to the first part of this invention.

The patentee claims, firstly, the manufacture of reflectors, by applying pottery or earthenware, coated with silver lustre. Secondly, the conveying the supply of gas through the chimney, and the application of the convex glass front, as described with reference to fig. 1; also the arrangement of railway lamp shewn at fig. 2; also the arrangement of the gas-burner and apparatus, as shewn at fig. 3; also the construction of the upper part of a lamp with a reflector, as shewn at fig. 4; also the arrangement of drop roof lamp for a railway carriage, as shewn at fig. 5; and also the arrangement of apparatus and reflectors for a gas or fuel stove, as shewn at fig. 6. —[*Inrolled May*, 1849. Lond. Jour. Arts, June, 1849.

Specification of a Patent granted to THOMAS DRAYTON, *of the County of Middlesex, for improvements in Silvering Glass and other Surfaces.*— Sealed December 4, 1848.

This invention relates to silvering glass without the use of quicksilver, for which Mr. Drayton obtained a patent November 25, 1843*. It consists in causing silver to be deposited from a solution of that metal upon glass, in such manner that a precipitate of silver will adhere to the glass without any previous coating being applied thereto; and it also consists in coating other substances with silver in the same way.

The mode of carrying out the invention is as follows:—One ounce of hartshorn or ammonia, two ounces of nitrate of silver, three ounces of water, and three ounces of spirit, (spirit of wine being preferred,) are carefully mixed together; the mixture is allowed to stand for three or four hours, and then it is filtered. To each ounce of the filtered fluid is added a quarter of an ounce of saccharine matter, dissolved in equal parts of spirit and

* For description of this invention, see Lond. Journ. Arts, Vol. XXIV, p. 421; and Journ. Frank. Inst., Vol. VIII, 3d series, p. 193, Sept. 1844.

water, say about half a pint each. The patentee states that the saccharine matter which he prefers to use is grape sugar, the solution being allowed to stand for a few hours. The liquid may be used for depositing silver either upon horizontal or vertical surfaces, provided it is kept in contact with the glass, which is to be kept heated to about 160° Fahr., until the required deposit of silver has been obtained. As soon as the silver upon the glass is perfectly dry, it may be varnished with common mastic varnish, to preserve it from being injured by friction.

The patentee states that this invention may be employed for depositing silver upon looking glasses and every other description of glass, either hollow or having a flat surface. The process is not at all unhealthy or injurious; and no smell of any kind arises during the operation of silvering, or after the glass has been silvered. The superiority of this process over the ordinary one consists in the production of a coating of silver of great durability, and capable of withstanding heat as well as damp to a very extraordinary extent. It is stated that the solution will deposit silver upon metals in a very perfect manner.

The patentee does not confine himself to the precise details above described, provided the peculiar character of the invention be retained, whereby silver is deposited on to glass from a solution of that metal, in such manner as to cause the silver to adhere to the glass without any previous coating of the latter, and without the use of oils.—[*Inrolled June*, 1849.

Lond. Journ. Arts, July, 1849.

MECHANICS, PHYSICS, AND CHEMISTRY.

Report on the Gases evolved from Iron Furnaces, with reference to the Theory of the Smelting of Iron. By Prof. Bunsen, *of Marburg, Hesse Cassel, and* Dr. Lyon Playfair, *of the Museum of Economic Geology, Department of Her Majesty's Woods and Forests.*

From the Report of the British Association for the Advancement of Science, for 1845.

(Continued from page 147.)

On the Application of Furnace Gases to Practical Purposes.

In this division of the subject we have to consider the useful purposes to which these gases may be applied when employed as fuel. Their practical value does not so much depend on the amount of heat capable of being generated by their combustion, as upon their maximum temperature; and both these conditions may be exhibited by examining the composition of the various mixtures of gases obtained from different depths in the furnace. But it would be erroneous to suppose that the values thus obtained by calculation expressed, in all cases, the average practical effects capable of being derived by their application on the large scale, for such a conclusion would only be justifiable when the numbers obtained by analyses expressed the average value. That this is not the case has been shown in the above considerations as to the proportion between the nitrogen and oxygen, for we observed at the depth of fourteen feet, when the gases were richest in combustible materials, this relation was the least observed. Even in the highest layer of the gaseous mixture, the constituents of which may be viewed as most intimately mixed, we obtain a combustible value more than one-third greater than the above, when we estimate it according to the composition of the materials thrown into the furnace, and the products of distillation of the coal. In order, therefore, to found our calculations on a firm basis, we will estimate the practical value of the gases according to the results obtained in our former calculations, as to the limits of variation in the value of the gases, when deduced from the composition of the materials with which the furnace is supplied. This mode of proceeding will safely lead us to numbers expressing the average value, and will enable us to repose upon them with confidence, from the assurance that the results capable of being obtained on the large scale, must be much greater than those expressed by calculation.

Our experiments have proved the combustibility of the entire column of gas, even when cold, from a depth of twenty-four feet to the mouth of the furnace. Hence it follows that the gas collected from any point to this depth is capable of being applied as fuel. It would be objectionable, however, to conduct the gas from a deep region of the furnace, because we should thus draw off the heat necessary to support the process of coking the coal in its upper part. The gas might be collected from the upper part of the furnace without any detriment to the process, and with additional advantage as fuel, because, while it contains all the combustible products of distillation, it is not deteriorated by having taken up any incombustible ingredients. This circumstance greatly facilitates the application of the combustible gases, for it removes the obstacle to their use in furnaces fed with charcoal. In the latter, the zones of distillation and reduction lie more closely together, and the proportion of ore and limestone to the coal is so much greater than in this country, that the amount of carbonic acid evolved obliges the withdrawal of the combustible gases from a low region of the furnace, where the reduction of the ore and evolution of carbonic acid have been completed. But the withdrawal of the gaseous fuel from a region below that of the reduction necessarily produces such disturbance in the operations of the furnace, that only a small part of these gases dare be removed, while the largest portion must still be allowed to remain and administer to its necessities. The advantage to be derived from the use of the gaseous fuel in this country will therefore be the more obvious, when we consider that its application cannot derange any of the processes essential to the reduction and smelting of the ore. In furnaces fed with charcoal, the gaseous fuel has been collected and applied without any great difficulty, by building into the wall of the furnace a circular channel, supplied in the inner part with a grating, so as to prevent its obstruction by the materials introduced into the furnace. The gases stream freely through this channel, even though the furnace is left entirely open, and though the pressure is so inconsiderable as scarcely to affect a water manometer. The great pressure of blast used in English furnaces led us to the conviction that in them the column of gas must be much more compressed, and we have confirmed this opinion by a series of measurements on a water manometer attached to the tube through which the gases were collected for experiment. The pressure of the gases expressed by the height of the column of water at various depths is as follows:—

5 feet,	0·12 inch.
8 "	0·40 "
11 "	1·10 "
14 "	1·60 "
20 "	1·80 "
23 "	4·70 "
24 "	5·10 "

This table proves that even in the highest portion of the gaseous column, the pressure is considerably greater than in that region of the furnace from which the gases are withdrawn in Germany.

Hence it follows that hot-blast furnaces fed with coal are peculiarly well-adapted for the economy of gaseous fuel, which may be conducted from the furnace, and applied without in any way interfering with its operations.

We have already shown, on the very lowest calculation, that at least 81·54 per cent. of valuable fuel must escape from the mouth of the Alfreton furnace. Now as about fourteen tons of coal are used in that furnace every twenty-four hours, it follows, according to our experiments, that 11·4 tons of coal are lost every twenty-four hours, by escaping in the form of gases still capable of being used as excellent fuel.

We have previously shown that the temperature capable of being attained by the combustion of these gases is 3083° Fahr., (1695°·2 C.,) and, by using a blast sufficiently heated, this could easily be raised to 3632° Fahr. (2000° C.) Now, as Pouillet has shown that cast iron melts at 2192° Fahr., (1200° C.,) it follows that the gases of hot-blast furnaces fed with coal, when burned with hot air, would yield a temperature more than sufficient to melt iron.

The gases of our furnaces fed with coal contain a very valuable constituent, which is entirely absent from the charcoal furnaces of the continent. This substance is ammonia, which is present in such abundance as to be sensible to the smell in the gases collected from the deeper parts of the furnace. We have, therefore, devoted our special attention to this valuable ingredient, and have arrived at the conclusion that it is possible to economise it in the most simple manner. The ammonia may be obtained in the form of sal-ammoniac, if the gas, previous to its application as fuel, be conducted through a chamber containing muriatic acid. In collecting the ammonia in this manner, there need be little fear of any considerable deposition of tar, for the product of distillation flows back upon red-hot coal, and is so completely decomposed, that the tube, thirty feet long, used by us for a period of twelve hours in collecting the gases, scarcely contained a trace of tar, although its temperature was not sensibly higher than that of the surrounding air. If the solution of sal-ammoniac produced by the condensation of the ammonia be allowed to flow into an evaporating pan, over the surface of which a small part of the flame of the combustible gas is allowed to play, a convenient arrangement of the liquid, and of the burning stream of gas, would enable us to obtain a constant flow of a concentrated solution of sal-ammoniac as an auxiliary in the manufacture.—The advantage of its collection is, that, without any further consumption of fuel, or any considerable expenditure of labor, a valuable commercial ingredient would be economised. Hence it is of importance to estimate how much ammonia we might hope to obtain in this way; and this is easily determined by the quantity generated during the distillation of coal. We have subjected the furnace coal of Alfreton to various trials, both by distilling it *per se*, and along with a mixture of soda and lime, and then by separating the ammonia in the usual way from the liquid products of distillation, by means of chloride of platinum.

I. 2·887 furnace coal of Alfreton, heated with soda and lime, yielded 0·0801 chloride of platinum and ammonia.

II. The experiment repeated with 5·687 coal, gave 0·175 chloride of platinum and ammonium.

III. 20·455 grms. distilled *per se*, gave a product collected in muriatic acid, which, after separation of the tar, yielded 0·7681 chloride of platinum and ammonium.

Hence 100 parts of the furnace coal of Alfreton yields the following quantities of sal-ammoniac:—

I. Experiment,	0·666
II. "	0·739
III. "	0·902
Mean,	0·769

Now, as 280 cwt. of coal is consumed in the Alfreton furnace every twenty-four hours, it follows that more than 2 cwt. sal-ammoniac might be obtained from it as a subsidiary product, without increasing the cost of manufacture, or in the slightest degree disturbing the process of smelting.

We have confined ourselves, in this examination, principally to the consideration of the furnace coal of Alfreton, but we may naturally expect considerable differences as to the amount of nitrogen in other coals used in this and in other countries. The estimation of the nitrogen, with regard to the possibility of applying the ammonia generated by their distillation, thus becomes a question of considerable importance. We therefore reserve for ourselves the prosecution of this inquiry in a succeeding paper. Before leaving this subject, however, we have to allude to some experiments, showing the facility of condensing the ammonia.

As the gases from the upper parts of the furnace are saturated with aqueous vapor, which condenses along with the ammonia in the lead tube with which they were collected, we have taken the proportion of the ammonia carried away in the gases, so as to compare it with that which had suffered condensation. For this purpose, the gases flowing through the iron and lead pipes, sunk from eight to ten and a half feet beneath the charging-plate, were conducted through muriatic acid for two hours and seven minutes. We determined the volume of the gas passing through the acid by collecting it at various times during the experiment in a balloon made of gold-beater's skin, of the capacity of 380·8 cubic inches, observing the time which was required to fill the balloon. The mean result, which deviated only slightly from the individual trials, showed that the gas required 1′ 7″ to fill the balloon, and therefore that 43304·76 cubic inches have passed through the muriatic acid. The examination of the muriatic acid used in the experiment gave 0·198 grm. chloride of platinum and ammonium, corresponding to 0·0152 ammonia. If we assume as the composition of the gases that formed at a depth of eight feet, we can easily calculate the quantity of coal necessary to produce the above 43304·76 cubic inches of gas. According to analysis, 1000 cubic centimetres of this gas contain 547·7 cubic centimetres of nitrogen. We have already seen that nitrogen is not produced from the materials introduced into the furnace, and hence all the amount present must have been introduced by the blast as atmospheric air, which, burning before the tuyère, mixed with the gaseous products of distillation in the upper parts of the furnace, and produced the above 547·7 cubic centimetres of nitrogen. But as this amount of nitrogen is derived from atmospheric air, it implies that 143·84 cubic centimetres, or 0·2066 grm., of oxygen has been consumed in the lower part of the furnace by uniting with 0·1549 grm. of coke, in the formation of carbonic oxide. But, as has already been shown by a previous experiment, 0·2304 grm. of coal must have been distilled to produce the 0·1549 grm. of coke; and as the above quantity of coal is required to generate one litre of the above gaseous mixture, 163·5 grm. must have been employed in the generation of the 43304 cubic inches of gas washed by the muriatic acid. Hence it follows that only 0·0093 grm., or 3·77 per cent. of the ammonia generated from 100 parts of the coal (which according to our experiments amounts to 0·2463 grm.) pass over along with the gases; so that the remaining 0·2370 grm., or 96·23 per cent. of ammonia, must have been condensed in the water of distillation found in the tube. In fact, we ascertained that the lead tube contained a clear liquid so strongly charged with ammonia as instantly to render blue reddened litmus paper held over it. These experiments prove how easily the ammonia might be condensd, even without the intervention of an acid.

It will be observed that the gases from the inferior parts of the furnace contain cyanogen, the presence of which is highly interesting, not only in a theoretical, but also in a practical point of view. This gas appears immediately over the point of entrance of the blast, and again disappears at a small elevation above it, so that at the top of the boshes only traces of it are observed. The compound of this substance with potassium appears to play a most important part in the furnace, although its functions have apparently been altogether overlooked. This is the more surprising, as it has long been known that cyanide of potassium effloresces on the walls in certain states of the furnace. We have been fortunate enough to elucidate the conditions of its formation, and to fix its region in the furnace. In obtaining information with regard to the formation of this cyanogen gas, it was necessary to withdraw the gases from the vicinity of the hearth of the furnace, and through the kindness of Mr. Oakes, we were enabled to bore a hole over the *Front* of the furnace, two feet nine inches above the level of the tuyère. As soon as this hole was made a gas issued from it, possessing strong illuminating powers, and burning with a yellow flame, from which came abundant vapors of white smoke. On introducing an iron pipe into the hole, without allowing it to pass into the furnace, it was retained sufficiently cool to prevent its fusion, and we were enabled to collect the volatile products. The gases which poured out of this tube under a pressure of several feet of water, were so richly laden with vapors of cyanide of potassium, that we were obliged to use precautions in approaching its opening, so as not to suffer injurious consequences from this poisonous material. Although the conducting tube was twenty-two feet in length, the amount of cyanide of potassium carried along with the gas was so considerable as to fill, in a very short time, glass tubes of one-eighth of an inch in width, and we therefore endeavored to obtain an approximative result as to the amount which thus passed over with the gases and escaped condensation in the long tube. The opening of the iron tube was connected with an empty Woulf's-bottle, to which another was attached containing water, in such a manner that the gas had to stream through a layer of four inches of the latter. The first of these bottles became quickly filled with a rich white sublimate of dry cyanide of potassium, while the water in the second became a tolerably concentrated solution of the same substance. It was now necessary to determine the quantity of gas which passed through the bottles, and this we ascertained by accurately noting the time employed in the experiment, and the exact period necessary to fill a balloon of known capacity attached to the second bottle.

1. Duration of the experiment, 24 minutes.
2. Mean time required to fill the balloon, 25 seconds.
3. Capacity of the balloon, 380·8 cubic inches.

Hence it follows that 21,933 cubic inches of gas passed through the bottle. The cyanide of potassium in the Woulf's-bottles and their connecting tubes were made into one solution, which weighed 381·024 grms., and 129·211 grms. of this solution yielded 0·62208 grm. cyanide of silver, which was easily decomposed by fuming sulphuric acid. Hence, in the 21,933 cubic inches of gas which had passed through the flasks, there must have been 0·8944 grm. of cyanide of potassium held in mechanical suspension. We have already seen that the gas possessed the following composition:—

Nitrogen, - - - -	58·05
Carbonic oxide, - - -	37·43
Hydrogen, - - - -	3·18
Cyanogen, - - - -	1·34
	100·00

The 21,933 cubic inches of gas, admitting only its approximative estimation, its temperature being neglected, must contain 1192·97 grains of carbon, corresponding to 1774·79 grains of coal. Hence, out of 100 parts of coal at least 0·778 of cyanide of potassium are generated; and as 31,200 pounds of coal are consumed every day in the furnace, it is obvious that at least 224·7 lbs. of cyanide of potassium are generated daily in the Alfreton furnace, and hitherto have been altogether lost.

When the iron tube used in the experiment was withdrawn from the furnace, it was found to be encrusted with melted cyanide of potassium, which speedily deliquesced in the air. On bringing it in contact with water, a considerable quantity of hydrogen gas was evolved, obviously due to the presence of reduced potassium, or to its compound with carbonic oxide. In the tube itself at least three or four times the amount of cyanide of potassium was condensed, so that we may be quite certain that the amount formed is far more considerable than we have stated. With these unexpected results before us, it became of importance to determine the origin of the large quantity of potassium in the furnace. At first, we conceived that it might be present in the limestone, which not unfrequently contains carbonate of potash, according to the researches of various chemists; but on examining as much as 30 grammes, we were unable to detect in it the smallest trace. However, we were informed by Mr. Charles Oakes that he had detected the presence of potash in the iron ore, and we are glad to be able to confirm the result of this talented young chemist. We have subjected an average sample of the calcined ore to analysis, according to the methods usually employed in such cases. The quantity used in the analysis was 2·324 grms., which yielded 1·400 peroxide of iron, 0·153 alumina, 0·145 carbonate of lime, 0·202 phosphate of magnesia, and 0·599 silica. In order to estimate the amount of potash, 17,936 grms. were ignited with carbonate of barytes dissolved in muriatic acid, and the bases, after separation of the silica, were as much as possible precipitated by carbonate of ammonia. The solution was then freed from barytes by means of sulphuric acid, and the excess of the latter removed by evaporation with chloride of strontium. In this way the remaining bases were converted into chlorides soluble in alcohol, and the solution mixed with chloride of platinum and evaporated to dryness in the water-bath, left a residue, which, treated with alcohol to dissolve out the other chlorides, consisted of pure chloride of platinum and potassium, and weighed 0·689 grm. This analysis gives the following composition for the calcined ores:—

Silica,	25·775
Peroxide of iron,	60·242
Alumina,	6·583
Lime,	3·510
Magnesia,	3·188
Potash,	0·743
Manganese,	traces.
	100·000

Another source of the potash was found to be in the coal, although to a less extent than in the ore; 1.627 grm. of the coal, dried at 212°, yielded 0·122 grm. of water; 0·2865 grm. gave 0·7865 grm. of carbonic acid and 0·153 grm. of water; 2·887 grms., heated with the mixture of soda and lime, gave 0·0801 of chloride of platinum and ammonium. The experiment, repeated with 5·687 grms., gave 0·175 of the above salt; 13·059 grms. of coal yielded 0·3505 grm. of ashes, which did not effervesce with acids; and this quantity of ashes, treated as in the case of the iron ore, gave 0 046 grm. of chloride of platinum and potassium. The coal, therefore, is composed as follows:—

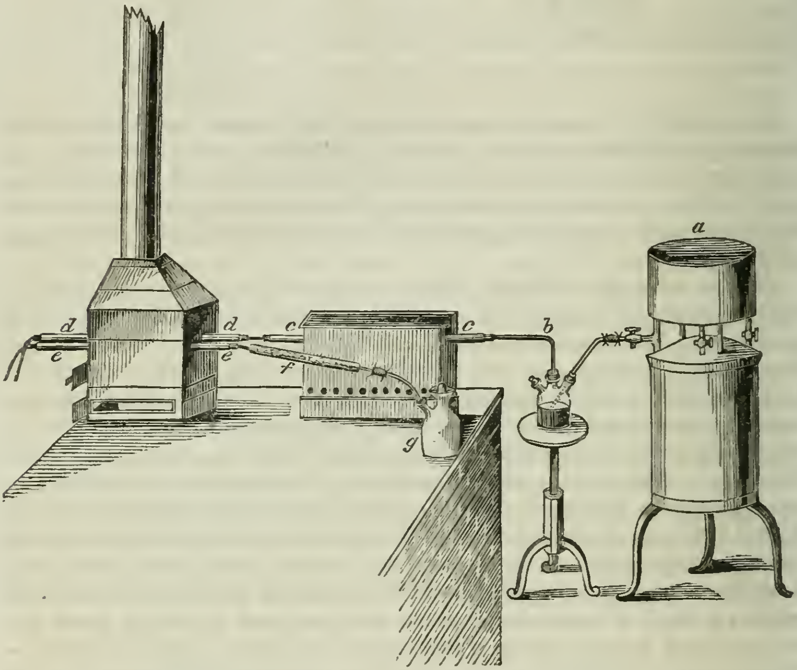
Carbon, - - - -	74·98
Hydrogen, - - - -	4·73
Oxygen, - - - -	10·01
Nitrogen, - - - - -	0·18
Water, - - - - -	7·49
Silicates, - - - - -	2·61
Potash, - - - - -	0·07
	100·00

The quantity of ironstone consumed by the furnace every twenty-four hours is 33,600 lbs., and that of coal 31,200 lbs., so that the furnace receives every day, in these materials, 271·48 lbs. of potash, corresponding to 377·3 lbs. of cyanide of potassium. Thus these analyses render intelligible the large quantity of potash which we observed in the inferior parts of the furnace.

But we have yet to discuss the most interesting and important question bearing upon the presence of cyanide of potassium, viz. the origin of its cyanogen. We know how easily ammonia, in contact with carbon at high temperatures, is converted into cyanide of ammonium. Hence we should be apt at once to admit that the formation of cyanogen is due to the ammonia so freely evolved from the coal during its distillation; and if this view were correct, the existence of one must arise from the destruction of the other. But when we view more closely the circumstances under which the cyanogen is produced, we are compelled to admit that the ammonia cannot take part in its formation. The hearth, at which the formation of cyanogen takes place, is the deepest and hottest part of the furnace, and it would be absurd to suppose that the coal which reaches this part could contain a trace of ammonia, exposed as it has been for eighty hours to a red heat, and in one part to a temperature sufficient to reduce potash.—Hence we are compelled to adopt the only remaining conclusion, that the nitrogen of the air introduced by the blast combines directly with carbon to form cyanogen. This direct formation has been argued for by various chemists, and supported in this country by the experiments of Fownes and Young. But as it has been objected to experiments of this kind, that they were instituted without reference to the ammonia of the air, which is apt to be taken by most substances exposed to it, it is scarcely to be wondered at that the direct generation of ammonia is still doubted by distinguished chemists. We have, therefore, thought it necessary to determine this disputed question by an experiment which seems to banish all sources of error. We have led simultaneously, and under exactly the same conditions, a stream of carbonic acid and another of nitrogen, at a very high temperature, over a mixture of two parts of charcoal from sugar, and one part of chemically pure carbonate of potash, and have subjected the products to careful examination.

The apparatus used by us in these experiments is represented in fig. 9; *a* is a gasometer, from which a uniform stream of air is made to pass through a bottle filled with sulphuric acid (*b*), and then through a gun-barrel (*c c*) filled with copper turnings. The gun-barrel is kept in a furnace, so that the air passing through it is thoroughly deprived of oxygen, and passes into the gun-barrel (*d d*) filled with the mixture of charcoal and potash, and heated to a temperature sufficient to reduce potassium. In the same furnace is placed another gun-barrel (*e e*), filled with the same mixture, and over which is passed a stream of dry carbonic acid from the apparatus *f g*.

Fig. 9.



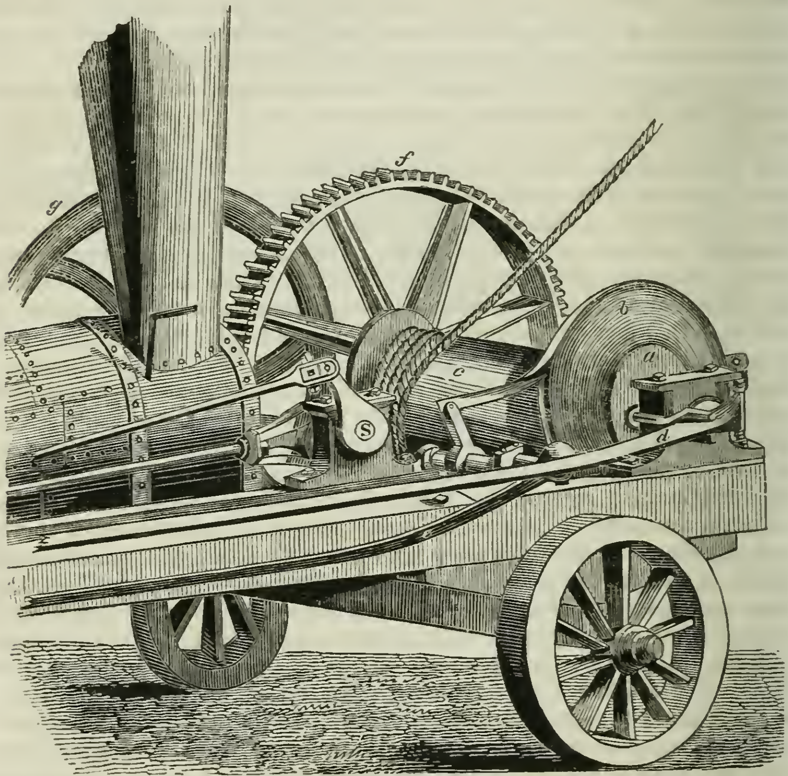
When both the systems were completely filled, one with nitrogen, and the other with carbonic acid, the streams of gas were allowed to pass slowly over the mixture of potash and charcoal, both the tubes in the same furnace being kept at a temperature sufficient to reduce potassium. The gas passing out of the tube filled with carbonic acid had all the characters of pure carbonic oxide, being transparent, inodorous, and burning with a pale blue flame, without depositing any kind of sublimate. The tube over which nitrogen passed emitted a gas richly laden with a white smoke of cyanide of potassium, which sublimed in such quantity as to stop the conducting tube. When the nitrogen was passed so slowly through the sulphuric acid that the bubbles passed only once in a second, its absorption by the potash was complete, and no gas appeared at the mouth of the gun-barrel; but as soon as the temperature was lowered, so as to be under that necessary for the reduction of potassium, the absorption of nitrogen ceased. The contents of the tube over which carbonic acid had passed were examined after cooling, without the detection of the smallest trace of cyanide of potassium. The mixture treated with nitrogen, on the other hand, dissolved (with the exception of its charcoal) with a very powerful odor of hydrocyanic acid. The solution exhibited all the reactions of cyanide of potassium, and yielded 6·982 grms. of cyanide of silver, which dissolved (with decomposition) in fuming sulphuric acid, without leaving any residue of chloride of silver after being diluted with water. Hence we cannot for a moment demur to the following conclusion,—That a considerable quantity of cyanide of potassium is formed in iron furnaces immediately above the point where the blast comes in contact with the glowing fuel, and that it owes its formation to a direct union of carbon with potassium and nitrogen of the air.

Our experiments have further shown that cyanide of potassium is volatile at high temperatures, and this property is of much influence in the part which it takes in the reducing process of the furnace. Carried up by the ascending current of gas, the cyanide of potassium, partly in a state of vapor, partly as a solid, reaches the region of the furnace in which the reduction is effected, and here it exerts its well-known reducing power. In consequence of this it is decomposed into nitrogen, carbonic acid, and carbonate of potash, the former of which passes up with the ascending gaseous column to the mouth of the furnace, while the latter, not being volatile, falls back with the other materials in the furnace, to that point where it is again converted into cyanide of potassium, under the influence of the carbon and nitrogen. Hence a large quantity of ore may in this way be reduced in the lower part of the furnace, by comparatively a small quantity of regenerated cyanide of potassium. The importance of this view of the part played by cyanide of potassium, although previously entirely neglected, will be seen when we consider that this powerful reducing agent must accumulate in the furnace to a considerable extent. The region of the furnace where the highest temperature prevails forms a limited space, beyond which the cyanide of potassium cannot extend to the lower parts of the furnace, until its quantity is so much increased, by the potash descending in the materials supplied, that the excess of cyanide of potassium escapes volatilization and reaches the blast, where it is burnt and converted into nitrogen, carbonic acid, and carbonate of potash, the basis of which unites with the slag. We have already shown that the relation of the nitrogen to the oxygen in the gaseous mixture, collected only two and a half feet over the tuyère, is 79·2 : 22·8, after deducting a quantity of oxygen corresponding to the hydrogen. If the gas generated at this place contained only the nitrogen and oxygen due to the air, the proportion would be 79·2 : 20·8; and hence it follows that the gases at this point must either have obtained oxygen from a source independent of the air, or that a proportion of nitrogen has been abstracted from them. Any one who has had the opportunity of observing the temperature of the furnace at this part, will at once agree with the opinion that the excess of oxygen cannot be derived from the carbonic acid or iron ore. A simple inspection of the materials enables us to reject such an explanation as erroneous, for the fused materials flowing from the furnace do not evolve gas, although they come from a point in the immediate vicinity of that where the oxygen has been taken up.

We must, therefore, admit that this phenomenon is connected with the formation of cyanide of potassium in the furnace. The potash, as it yields its oxygen to carbon during its conversion to cyanide of potassium, assumes for every volume of oxygen lost by it, two volumes of nitrogen in the form of cyanogen, and consequently the proportion of nitrogen to oxygen is necessarily increased.

Improved Portable Steam Hoisting Machines for Loading and Discharging Cargoes. By A. L. Archambault, *Philadelphia.*

This useful invention, of which the annexed cut is a representation, was built for Charles Bentric, a stevedore of Philadelphia, who has successfully tested it in discharging the cargoes of the ships Austria, Monongahela, and Hercules.



The operation of the machine is briefly as follows:—The motion of the engine is communicated to the fly-wheel shaft S, which carries a small pinion gearing into the large wheel *f;* the winding barrel *c*, to which the hoisting rope is attached, is locked to the shaft of the wheel *f* by means of the driving friction coupling *a*, the latter being thrown into or out of action by the lever *d;* and the motion of the drum *c*, when free from the shaft of the wheel *f*, is controlled by the friction band *b*, which is tightened or slackened by the brake *e*.

The machine requires but a single person to keep up steam and attend to the brakes, and is capable of hoisting twelve hogsheads of tobacco from the hold of a vessel and turn them out on the wharf in ten minutes, or can discharge cotton at the rate of three hundred bales per hour. In case the hogshead or other article being raised should strike on the combings of the hatchway, the engineer has only to slacken the brake, and it is lowered, without stopping the motion of the engine, so as to clear the obstruction, and then, by drawing the lever of the brake tight again, the ascending motion is restored. The lowering brake is so arranged that a hogshead of tobacco can be suspended at any point required with the greatest ease. The machine being on wheels, is portable in its character, and can be moved about with a single horse.

A machine of this description should be procured by the stevedores of every sea port, California not excepted.

For the Journal of the Franklin Institute.

An Essay on the Physics of Steam. *By* THOS. PROSSER, C. E., *New York.*

(Continued from page 136.)

That steam must be either saturated or surcharged will be readily admitted, and therefore, although the fact of its issuing from a high state of elasticity into the atmosphere, at the temperature due to saturated steam under that pressure, does not, *per se*, prove it to be surcharged, yet, taken in connexion with another fact, viz. that such steam does not scald the hand, affords certain proof that there is some physical difference between expanded steam and steam which has not been expanded; and as only two states of existence are known—saturated and surcharged—it necessarily follows that, on the score of probabilities, we are entirely justified in assuming that it is surcharged, in the absence of any reliable direct experiments on the subject.

It has been mentioned before that low pressure steam is a conductor of electricity, and I may now add that high pressure steam is a non-conductor,* but what bearing this has on the cause of expanded steam being surcharged it is difficult to say, in the present state of our knowledge of that most mysterious agent; whether, as the cause, in consequence of the electricity being converted into heat, which Pelsier has shown to be possible,† or simply as another effect of the same cause.

The electricity of effluent steam was first noticed by an engine-man at Seghill, about six miles from Newcastle,‡ England. The first observations on the electricity of a jet of steam, while issuing from a boiler, is contained in a letter addressed by H. G. Armstrong, Esq., to Professor Faraday, and published in the 17th volume of the London and Edinburgh Magazine, Oct. 14, 1840. There are also some very interesting remarks on the same subject in this Journal, 3d series, Vol. I, p. 123. Evaporation is undoubtedly the great source of electricity in the atmosphere, as well as in the boilers of steam engines, and there appears nothing irrational or unphilosophical in supposing that the converse of this may also be true, knowing, as we do, that heat and electricity, if not identical in nature, are at least mutually convertible into each other.

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*Journal of the Franklin Institute, 3d series, Vol. I, p. 123.

† Noad's Lectures on Electricity, p. 250, ¶ 408.

‡ Noad's Lectures on Electricity, p. 252.

When the electric spark is passed through oxygen and hydrogen gases, mixed in the proper proportions to form water, or as eight to one equivalents, a flash is seen to pervade the whole mass, which is instantly changed and converted into steam at a pressure of 14 atmospheres, the temperature of which must therefore be in the neighborhood of 387° F., even on the supposition that the mixed gases are of the same density as saturated steam, the one at the common temperature, and the other at the elevated one; but how does the matter stand in this respect? 66⅔ cubic inches of hydrogen gas will weigh 1·412 grs., and 33⅓ cubic inches of oxygen gas will weigh 11·296 grs., or eight times as much, making together 12·708 grs. as the weight of 100 cubic inches. This is about the same weight as 100 cubic inches of steam at a pressure of 25½ inches of mercury, and a temperature of 203° F.; but 14 atmospheres is equal to 420 inches of mercury, and if we imagine that the pressure will increase $\frac{1}{480}$ for each degree from 32°, we have the enormous temperature of 10,262° F., which is but 300° less than the reputed temperature of iron at a welding heat, before the required pressure is obtained; such is the energy with which electricity acts in composing water, when its constituents are thus brought into proximity. The decomposition of water is a very slow process, however, for it is reasonable to suppose that an equal amount of power is necessary, but there are no means known, by which sufficient energy of action can be produced to decompose a single drop of water, with anything like the rapidity with which the composition is effected. Hence it is difficult to imagine that the decomposition of water in a boiler can take place to any dangerous extent, even under the most favorable circumstances; but it is easy to see that if, under the combined influence of heat and pressure, free electricity should be generated, the sudden opening of a valve may scatter the water among the steam, and if, at the same time, the free electricity be converted into heat, we have ample reasons for expecting an explosion in any boiler so circumstanced, without approaching, except in a slight degree, the temperature which would appear necessary to decompose water.

MM. Jobard and Tassin support some such theory as this, and it does certainly account for many explosions that have taken place, and which no other does account for so rationally.

The cases alluded to are those in which there are several boilers in connexion, and which commonly explode simultaneously or nearly so, just as would be expected where the agent in operation was one of uncontrolable power. It appears to me that, to imagine free electricity as the effective agent in bursting boilers, in such cases at least, is far more rational than to assign it to free caloric, because dry or surcharged steam would appear to be particularly harmless, unless some such agent as electricity is brought to operate upon it, for, as steam, it must necessarily become surcharged by some means before it can be dangerous as an exploder, and the immense quantity of heat to be abstracted from the surcharged steam, and, if you please, from the red-hot boiler also, which disappears or becomes latent before steam of any great elasticity can be formed, precludes the idea of so slow a process as evaporation must necessarily be, unless some new and more energetic medium than ordinary is brought into operation.

To give an illustration of this, let us imagine steam at 100 lbs. pressure to the square inch, the temperature of which will be 329·6° F., and the volume 293 times that of the water from which it was formed; now in order to double this pressure instantaneously, (for it must be remembered that it is almost thus that the most terrific explosions do occur: that is to say, when first set in motion after having been for a time in a state of rest,) it is necessary that ·464 times as much water as that which already exists in such steam should be raised, together with itself, 54·8° F.; but this is a small part of the amount of the heat which must be abstracted to effect the contemplated change of elasticity, as 827·6° have disappeared or become latent in the fresh steam generated, being equal to 384° of the whole steam in the boiler, which is now at a pressure of 200 lbs. to the square inch, and temperature of 384·4°, occupying 147 times the volume of water from which it was generated; thus the whole heat which has to be developed instantly as it were, amounts to no less than 438·8° (= 54·8 + 384°). It is not very apparent how such an occurrence can take place by any well-known and ordinary means, but if it did, one boiler might burst, but it is altogether inexplicable how all of a suite should follow, as though they were so exactly of the same strength that they must inevitably stand or fall together, which no one at all acquainted with the mechanical skill (or rather the want of it) of some of the western boiler makers, would for a moment suspect. It would rather appear to me that some subtle agent, such as electricity, must be in operation, whose power is so far beyond the elasticity of any boiler, that the strength of the metal of which it may be made is not of the slightest importance.

The electric theory does not appear to be in favor with Dr. Albans, in his very excellent work on the high pressure steam engine, as it may interfere prejudicially with his pet. The Doctor seems to have no opinion at all of steam at less than 8 or 10 atmospheres, to which, indeed, he appears to have descended out of deference to public opinion rather than to his own, as his "first love" was probably much higher, and he has coquetted with steam at 60 to 70 atmospheres pressure.

For the Journal of the Franklin Institute.

Side Wheels and Propellers for Sea Steamers.

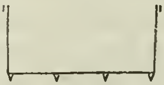
As this city is justly entitled to the credit of having done more to introduce the screw propeller to the public than any other, it is but just that *some* of the numerous patentees of that article who reside here should demonstrate the advantages that mode of propelling has over the much abused side wheel. From reading the city items of our daily papers for two years past, I had supposed that side wheels, for sea steamers, were among the things that *were*, and that we should no more see those large wheel houses which, from propeller reports, were so very objectionable at sea. You may judge of my surprise, when visiting New York, to find that all their sea steamers had side wheels, and that many more of the same kind were building. Being very well booked up on propellers, from reading the items before mentioned, I thought I should certainly be doing them (the New Yorkers) a benefit by explaining to them the many advantages of the screw over the side wheel, thereby saving them thousands of dollars, and benefiting society in general. I therefore informed them that, with equal power, a screw vessel would cost less money, carry more freight, and go faster at all times; and that, with head winds and heavy weather, the propeller was much superior. These facts I enforced with all the ability I possessed, and all good men will allow that my exertions merited some reward. But you may judge of my astonishment when told by them that I was behind the times, that propellers might do where money was scarce and speed no object, but for a city that had money, enterprise, and go-aheadativeness, screws were *too slow*, the machinery made too much noise, from its high velocity, and as for speed, their side wheel steamers could easily beat our propellers at any time, and in head winds, with heavy sea, a propeller was not good for much; that our "Columbus" was often seen beating at sea, (when the wind was ahead,) like a ship, and much more of the same tenor, and they finally wound up by saying that they were a *humbug* compared to side wheels, and pointed to the Cunard Steamers, the New Orleans Steamers, the Chagres Steamers, the Savannah Steamers, the Charleston Steamers, the Bremen Steamers, and to six large side wheel steamers building, and after so doing, asked me *what I had to say.* Having had my say before hand, and not being prepared for opposition, I immediately came home for further information based on facts, which I now respectfully solicit from the friends of side wheels and propellers.

John Jones.

Particulars of the new Iron Steamboat John Neilson, running from New York to New Brunswick.

This fine steamer was intended to be the foundation of a new epoch in steam navigation, and has received all the attention that could be bestowed upon her by her builders, the Messrs. Stevens, and it is a source of regret that she does not come up to their expectations.

The novelty in this boat was the forcing through the bottom several jets of air, under a pressure of 3 to 4 pounds to the inch. There were about 75 jets, of different sizes from 1 to 4 inches; each jet had a guard at its mouth, to direct the air aft; the bottom of the boat was flat, and her midship section like the annexed sketch, having four projections or keels of 3 inches deep, which were for guiding the air the whole length of the hull, where it escaped at the stern, it being supposed that a great advantage would be gained by a decreased draft of water and reduced friction while running. The following are her dimensions:—



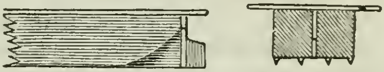
Length on deck, - - -	180 feet.
Breadth of hull, - - - - -	28 "
Depth of hold, - - -	8½ "

The engine has a 56-inch cylinder, 12 feet stroke, cutting off the steam at 6½ feet. Water wheel, 32 feet diameter and 10 feet face; paddles 28 inches deep; number of revolutions per minute, 20. Two boilers, 14 feet

6 inches long, 10 feet 7 inches wide, and 8 feet high, each having two furnaces, 7 feet long, and 4 feet 7 inches wide; each furnace has but one lower flue running to the back end of the boiler, and 180 two-inch tubes above, making 360 tubes in each boiler 10 feet long. The furnaces are supplied with air by two blowers, driven by two engines, with cylinders 12 inches in diameter and 12 inches stroke, making 50 revolutions, and geared 6 to 1. The air for the bottom of the boat is forced through by two blowing cylinders, 40 inches in diameter and 4 feet stroke, making 60 double strokes per minute; each cylinder is worked by a steam engine, with cylinder 16 inches in diameter and 4 feet stroke, cutting off at one-half. All of the engines exhaust into the condenser of the large engine.

The hold, for about 100 feet, is occupied by machinery, which requires an extra number of persons to attend it, and, from the high velocity of some portions, it makes more noise than usual.

In departing from established usage and developing new principles, all persons are likely to err: the enthusiasm connected with the new idea destroying the common sense attached or belonging to the old. The Messrs. Stevens have been thus misled, and from some experiments on a canal boat *in a canal*, which gave them a high result, they immediately projected the "John Neilson," (having first secured the patent,) and promised at least 30 miles per hour, at the same time adopting a model which, at this time, would be considered barbarous by the most ignorant ship-builder in the country. Imagine a boat of the midship section before given, with a lean bow, and a stern to this sketch, the full width being carried aft, similar to a canal boat, and then think of 30 miles per hour. With the blowing cylinders in operation, the boat makes about 15 miles per hour, and the large engine will make 1½ more revolutions when the blast is on the bottom than when it is off, while boats of the usual form and equal power will make at least three miles more, from which it is plain that the only gain is a loss, by the new arrangement. But this is only proved a loss so far as the "John Neilson" is concerned, for the air certainly helps *her*, and they find it advantageous to use it; and if it helps her, would it not assist a boat having as good a model as could be obtained? I think it would, and I have no doubt, the Messrs. Stevens will be ultimately rewarded with a moderate increase of speed. The projectors of new ideas rarely succeed at first, but I hope soon to hear of the more perfect development of their plan. D.



Translated for the Journal of the Franklin Institute.

Method of Determining the Quantity of Phosphoric Acid in Soils by means of a Normal Liquor. By M. E. Cottereau.

This method is based, first, upon the property which solutions of potassa and soda possess of transforming, at the boiling temperature, insoluble phosphates into the soluble phosphates of these bases; and, secondly, upon the property which nitrate of silver possesses of precipitating, at ordinary temperatures, these phosphates, by forming a phosphate of silver whose composition is Ag^2O^2, PO^5, and which is more and more easily deposited, leaving the liquor above, more and more clear, as the precipitation is more nearly complete, which allows the moment when the reaction has ceased to be easily determined.

The following is the method of operating: The phosphoric acid of the compound to be examined having been precipitated in an insoluble form, a known weight of these insoluble salts is boiled with four times its weight of carbonate of soda, dissolved in from 8 to 10 times its bulk of distilled water. The liquid is filtered, to separate the insoluble carbonates and other salts, and the filter twice washed with boiling distilled water. The filtered liquids are then thoroughly mixed, and divided into two exactly equal portions, which are separately introduced into two small mattrasses. To these liquids are then added, little by little, a test liquid, so made that each cubic inch represents a known quantity of nitrate of silver. The liquid used by M. Cottereau was made by dissolving in a litre of distilled water 48·57 grms of pure fused nitrate of silver, so that each cubic centimetre of the liquid represents 0·04857 of nitrate of silver, corresponding to 0·01 centigramme of phosphoric acid. After every addition the liquid is to be shaken, and the additions of liquid and agitations are continued until the liquid, when left at rest, becomes perfectly clear, and this clearing only takes place, as we have said, when the saturation is perfect. By a little care, the proportion of the acid may be determined to the half of a hundredth.

The proper precautions must, of course, be taken to avoid precipitating the chlorides and sulphates with the phosphates.

The phosphate of silver obtained may be always reconverted, by carbonate of soda, into phosphate of soda and carbonate of silver, which latter, being decomposed by nitric acid, reproduces the test liquid. The expense of the operation is, therefore, but small.

Comptes Rendus de l'Academie des Sciences, 22d Jan., 1849.

Translated for the Journal of the Franklin Institute.

Quantity of Gold from the Ural and Siberia.

We take from the Archives of Physical and Natural Sciences, published at Geneva, the following account of the production of the gold mines of the Ural and of Siberia, in 1847.

The washings of the auriferous sands gave, in the year 1847, the following results:—

Washings of the Ural, . . .	324·628 pouds.
of Nertschinsk, . . .	25·000
of Eastern and Western Siberia,	1431·315
Total product of the Russian washings,	1780·943 pouds.

Or about 29,100 kilogrammes (77,969·6 lbs. troy) of gold.

The Russian poud is 16,342 kilogrammes.[*]

To complete the account of the Russian production of gold in 1847, we must add the gold of the Altài, and of the silver mines of Nertschinsk, which is 45 pouds; so that the total production is 1825·943 pouds, or about 29,835 kilogrammes (79,938·9 lbs. troy) of gold in 1847.

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[*] According to Kupffer, (*Travaux de la Commission des Mèsures et des Poids, dans l'Empire de Russie*, 1841, *tom.* I, *p.* 331,) the value of the Russian poud is 16,381 kilogrammes, which would but slightly alter the above results.—[Ed. Fr. Journ.

The following table shews the increase of the product of this important working.

Aggregate of the Net Product of Gold in Russia.

Year.	Pouds.	Increase.
In 1839,	529·8	
1840,	584·0	55·2
1841,	690·2	106·2
1842,	679·9	289·7
1843,	1294·9	315·0
1844,	1342·0	47·1
1845,	1371·8	29·8
1846,	1722·7	350·9
1847,	1825·9	103·2

It appears that the space susceptible of being profitably worked—which is left to future generations—is immense.

Translated for the Journal of the Franklin Institute.

Action of Magnetism on all Bodies. By M. Edmond Becquerel.

At the meeting of the 21st May, 1849, of the Academy of Sciences of Paris, M. E. Becquerel communicated a memoir upon the effects of magnetism upon all bodies, the results of which are given in the Comptes Rendus of that date.

The following are the general deductions, the proofs of which will be anxiously looked for by men of science who have paid attention to the recent experiments on diamagnetism.

1. "All bodies become magnetic, as soft iron itself does, under the influence of a magnet, but in a greater or less degree according to their nature."

2. "The temporary magnetism of a body does not depend upon its mass, but on the manner in which the ether is distributed in the body."

3. "A substance is drawn towards a magnetic centre, by the difference of the actions exerted upon this substance and upon the volume of the medium displaced by it."

The effects were measured by the torsion developed upon small bars of the various substances, by an enormous electro-magnet. The continual oscillations are prevented by suspending under each bar a little sphere of lead or zinc, immersed in water or a solution of chloride of calcium.

"Measuring in this way the actions exerted upon substances moving in different media, I convinced myself of the enormous influence exerted by the surrounding medium. Thus, common glass, which, in the air, is attracted by the two poles of a magnet, is strongly repelled by these same poles when in solutions of iron or nickel; sulphur and white wax, which, in the air, are repelled by the centres of magnetic action, are, on the contrary, attracted when they are immersed in concentrated solutions of chloride of calcium or chloride of magnesium."

The following are his remarks upon the third general law announced above:—

"Thus a body is attracted or repelled by a magnetic centre, according as it is immersed in a medium less or more magnetic than itself; just as a balloon filled with gas falls to the surface of the earth, or rises in the atmosphere, according as the gas is more or less dense than the air. This third principle is, therefore, analogous to the principle of Archimides as to gravity, with this difference: that the latter applies to the mass of the body, while the magnetic intensity developed in a substance, by induction, in nowise depends upon it. Hence it results that the attractions and repulsions exerted upon different bodies, by either pole of a magnet near which they are brought, depend upon the same cause, and not upon two different orders of phenomena. In fact, under the conditions in which the experiments were performed, the attractions and repulsions follow the same laws, and vary in the same way, proportionally to the square of the magnetic intensity."

To explain the fact that all bodies are not attracted by the magnet in vacuo, and that certain substances, such as bismuth, sulphur, phosphorus, &c., are almost as much repelled in vacuo as in air, "it is necessary to admit that the etherial medium, by means of which magnetic actions are transmitted, is influenced in the same way but in a different degree in a void space, and in one containing matter; and that a void space behaves like a medium more magnetic than the substance which is most repelled: that is to say, bismuth."

"Certain gases, such as nitrogen, nitrous oxide, hydrogen, and carbonic acid, experience no appreciable action from the magnetism, in comparison with the torsion of a silver wire 0·045 mm. (0·018 in.) in diameter, and 35 centimetres (14 in.) long, but that oxygen is sufficiently magnetic to have its action easily measured. The air is also magnetic, and as its magnetic power is only about the fifth of that of oxygen, it follows that the effect is due solely to the presence of this latter gas."

"While seeking to shew the magnetic power of oxygen, by some method other than that by the differences of attraction and repulsion, which shew themselves, with small bars of glass and wax immersed successively in vacuo and oxygen, it occurred to me to measure the action exerted by the magnets upon little cylinders of charcoal which condense certain gaseous substances in large proportions. I then found that *a small bar of charcoal, which has condensed oxygen, oscillates between the poles of a strong magnet like a small magnetized bar*, whilst, in vacuo, it is in general repelled, and always feebly influenced by the action of magnetism."

"Comparing the power of oxygen with that of iron, we conclude that 1 cubic metre (10·78 cu. ft.) of air has an action represented by 11 centigrammes (1·65 grains) of iron. If we reflect that the earth is surrounded by a mass of air equal in weight to a stratum of mercury 76 centimetres (30·4 in.) in depth, it may be asked whether such a mass of magnetic gas, continually agitated and submitted to variations, both regular and irregular, of pressure and temperature, does not interfere in the phenomena dependent upon terrestrial magnetism, and perhaps in the diurnal variations of the magnetic needle. In fact, if we calculate the magnetic power of this fluid mass, we find it equivalent to an immense sheet of iron, rather more than $\frac{1}{10}$th of a millimetre (0·004 in.) in thickness, and covering the whole surface of the globe."

"Finally, we may then regard as demonstrated the principles announced above, to wit: that all bodies obey the action of magnetism, but in different degrees, and that the repulsions which shew themselves, of the two poles of a magnet upon certain substances, are due to the fact, that these substances are immersed in a medium more magnetic than themselves, which medium, by its reactions, gives rise to the effects observed. I do not, therefore, admit any difference between what has been called *diamagnetism* and magnetism properly so called."

For the Journal of the Franklin Institute.

Formula for Making Hyposulphite of Soda.

A Subscriber in the South, who practises the photogenic process, has met great difficulty in procuring the *pure* salt called Hyposulphite of Soda, free from sulphate of soda, and will therefore feel greatly obliged if any of your numerous correspondents will publish the formula or receipt for making the same.

In answer to a Subscriber, we offer the following as a good method of preparing hyposulphite of soda.

A strong solution of caustic soda is saturated with sulphur by boiling, and sulphurous acid gas passed through the clear solution, drawn off from the excess of sulphur, until a small quantity filtered off shows that the liquor has a pale yellow color. It is now filtered, evaporated rapidly until it has a syrupy consistence, again filtered if the liquid be cloudy, mixed well with half its volume of spirit of wine, and set aside to crystalize. The crystals are hyposulphite of soda. When the crystals contain too much sulphur, re-crystalization with alcohol will render them pure. The caustic soda lye is made by dissolving three pounds of crystalized carbonate of soda in two gallons of water, adding one pound of caustic lime previously slacked with one and a half to two quarts of water, boiling the liquid, letting it stand to settle, and decanting the clear liquid. The sulphurous acid is made by heating a thin paste of oil of vitriol and charcoal in a flask, with a tube passing from the cork and under the soda lye. J. C. B.

Machine for Manufacturing Printing Type.

The Earl of Rosse gave his third Soirée as President of the Royal Society on Saturday last. There were several models and inventions exhibited, the most remarkable amongst the latter being a machine for manufacturing printing types without fusing the metal and pouring it into moulds. The inventor, M. Petit, effects his process by the use of steel dies and matrices, which, by means of powerful pressure, impress the letters, &c., on copper fashioned into quadrangular strips of indefinite length wound round a cylinder.

The hardness of ordinary copper over type metal is in the proportion of

100 to 1. A London firm employed to print stamps for the Government, is in the habit of using raised copper surfaces for the purpose, no less than 125,000,000 impressions have been taken from one of their plates. The density of the copper used in the manufacture of type is considerably increased by the compression which it undergoes by the machinery of M. Petit. The machine produces thirty-two types per minute; and it would be difficult to exceed the typographic neatness of the character. Specimens of the type and printing were distributed among those present.

Lond. Athen., June 2, 1849.

Quantity of Ammonia in Atmospheric Air.

By a series of well-conducted experiments, M. Fresenius has determined that 1,000,000 parts of atmospheric air contains during the day 0·098 parts of ammonia, equal to 0·283 parts of carbonate of ammonia. During the night the same amount of air contains 0·169 ammonia, equal to 0·474 carbonate of ammonia. These results are known to be slightly in error, there being actually more ammonia in the air; they are, however, the closest approximations which have been made. Ibid. June 23, 1849.

For the Journal of the Franklin Institute.

It being the intention of persons in the direction of the construction of water works, to add a considerable expense in placing the pumps under the surface of the water to be raised, the writer is desirous of knowing what advantages will accrue in this arrangement, theoretical or practical, over the operation of pumps placed say five feet above the surface.

If any of the scientific readers of the Journal will be kind enough to give their opinion and reasons, and, if possible, data proving advantages, they will confer a favor upon a learner. A. B.

Philadelphia, August 25, 1849.

FRANKLIN INSTITUTE.

Committee on Science and the Arts.

Report on M. Villeroi's New Surveying Instrument.

The Committee on Science and the Arts, constituted by the Franklin Institute of the State of Pennsylvania, for the Promotion of the Mechanic Arts, to whom was referred for examination—"A new Surveying Instrument," invented by M. Villeroi—

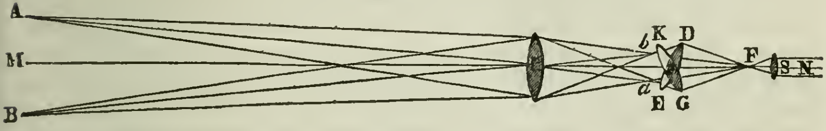
Report:—

That this instrument is intended to give the distances between the stations by means of a single observation through the instrument, without the necessity of using a chain or any other measuring apparatus.

It consists of an ordinary telescope, such as is used in the common level, but having attached to its eye-tube an appendage which we proceed to describe.

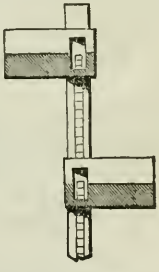
To the inner end of the eye-tube is screwed another tube of equal diameter, and divided throughout its whole length by a vertical partition or diaphragm. At the extremity of this tube, next the eye-piece, is placed a ring containing a bisected lens, D E G K, the two halves of which are equally inclined on opposite sides of the vertical plane, perpendicular to the axis of the telescope. The eye-tube is itself divided by a vertical diaphragm, which abuts against this system of semi-lenses, and is prolonged very nearly to the eye-piece S. In adjusting the instrument these two diaphragms must coincide accurately in the same plane, which is easily arranged by tightening or loosening the screw which connects the two tubes. The foregoing figure will make this arrangement easily understood.

Fig. 1.



The target staff (fig. 2) carries two targets, projecting on opposite sides of the staff, and at right angles to it. The lower half of each target is colored black, the upper half white. The upper target is stationary, and from its centre line a graduated scale proceeds downwards along the staff as far as is necessary. The lower target slides upon the staff, and carries an index opposite to its centre line, which indicates the degree of graduation to which its position corresponds. To understand the operation of this instrument, let us suppose the target staff erected at any distance, and the telescope adjusted to the eye of the observer. Let us consider, first, the upper target. The rays from this, which fall upon the object glass C, (fig. 1,) will form an image of the target in the instrument, from which image the rays will strike upon the two inclined lenses, which will form two images, one above and one below the axis, unless, however, the inclination of the lenses to the vertical plane perpendicular to the axis be very small, these two images will be too far apart to be both in the field of the instrument at the same time. Let us suppose that the lower image is alone visible. Now the lower target will also produce two images of itself, of which the upper one will be in the field of the instrument, and it is very evident that, by sliding it up or down on the staff, causing it to approach to, or recede from, the upper target, we can find a position in which the images of the two targets coincide, and their central lines then appear as one horizontal line crossing the staff.

Fig. 2.



The mathematical theory of the refraction of light through lenses shows that, when this is the case, the distance between the lines will be very nearly proportional to the distance of the target from the instrument, and the error made by assuming this proportion as strictly true is exceedingly small in any case, and diminishes as the distance increases, and at reasonable distances will be within the probable error of observation.

If, therefore, any instrument of this kind be placed at one extremity of a carefully measured line, and the distance between the targets at the other extremity be ascertained when the images of the centre lines coincide, this distance, divided into equal parts, will furnish the graduated scale necessary for the instrument.

The accuracy of the work performed by this instrument will depend, as well upon the care in determining the exact point at which the two lines coincide, as upon the precision with which the reading of the scale is effected. The rodman will, therefore, have a greater responsibility thrown upon him than at present, from which, however, the surveyor may relieve him by inspecting the staff himself previous to its removal from its station. Neither observation, however, is difficult, and the Committee do not believe that any practical difficulty will be found to arise from them.

The greater rapidity with which work can be done by this instrument presents a very great advantage, and the Committee think that, under certain circumstances, such as surveying in rocky, bushy, or swampy grounds, it will be found very valuable. It also allows the easy determination of distances in places where direct measurement is impossible, such as across broad sheets of water.

The Committee, therefore, believe the instrument of M. Villeroi to be a valuable addition to our surveying apparatus.

By order of the Committee,

William Hamilton, *Actuary.*

Philadelphia, April 12*th*, 1849.

Report on the Catoptric, Dioptric, and Catadioptric Systems of Lights for Lighthouses.

Appendix containing the Notes referred to in the Report.

Continued from page 166.

Note 3. Report of I. W. P. Lewis; also, the Annuaire, by Arago; the Report to the British Parliament of 1845, with the appendix to the same, and the Notes of Stevenson, all before cited.

Also, Report of the Committee of the Royal Society of Edinburgh, Prof. Forbes, Reporter, (cited in doc. 138 and 258, previously cited, also page 60 of doc. 488, previously cited.) The Committee were Greenock, Robinson, Trail, Christison, and Forbes.

Also, Letter from Leonor Fresnel, (not the inventor of the Fresnel lights,) the Secretary, to the Commissioners of Lights, (France,) 31st December, 1845, in doc. 488, previously cited.

Extract from page 118 *of this document.*

COMPARISON OF THE TWO SYSTEMS OF LIGHTS.

[Parallel between the Catoptric and Dioptric Lights.]

I will consider the two systems under the following heads:—

1st. The *absolute useful and economical effects.**

2d. The *first cost of the establishment*, and of *the repairs* and *maintenance.*

3d. The *facility* and *safety* of the service.

[Apparatus of the 4th order, smaller model.]

Sec. 1. *Absolute useful and economical effect of the illuminating apparatus.*—The brilliancy of a catadioptric apparatus of 30c. (11·8 inches) interior diameter, illuminated by a lamp burning 45 grammes (1 ounce $9\frac{4}{10}$ drachms avoirdupois) of oil per hour, has been found to be equal to 8 or 9 burners.

The brilliancy of a "sideral" reflector, illuminated by a lamp burning 50 grammes (1 ounce $12\frac{25}{100}$ drachms avoirdupois) of oil per hour, is equal to 4 burners. This brilliancy of the first is at least *double* that of the second.

The useful effect of the catadioptric apparatus of the 4th order, illuminating three-fourths of the circumference of the horizon, is represented by 137700. The useful effect of the sideral reflector is equivalent to 68400. Comparison of the second to the first =1 to 2. Economical effect of the catadioptric apparatus =3060. Economical effect of the sideral reflector =1368. Comparison of the second to the first =1 to 2·24. If we take for a term of comparison the ordinary reflector, (à coquille plate,) the superiority of the catadioptric apparatus will be still more decided. With regard to the concave parabolic reflectors, or photophores, I will not introduce them into this parallel, in consideration that they can only serve in isolated cases for the ordinary illumination of the entrances to harbors, upon an amplitude of not more than 20°.

[Apparatus of the 3d order smaller model.]

The apparatus of the 3d order, smaller size, illuminated by an ordinary fountain, or constant level lamp, carrying one burner and one wick, consuming 60 grammes (2 ounces $1\frac{9}{10}$ drachms avoirdupois) of oil per hour, or one burner with two wicks, consuming 115 grammes (4 ounces and 1 drachm) of oil per hour, have not equivalents in the catoptric apparatus in use at present.

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* In a previous part of the letter the author says:—

"1st. *The useful effect* of a parabolic reflector increases with its dimensions, and with that of the illuminating body.

"2d. *The economical effect* of a reflector of given dimensions is greatest when the lamp-burner is smallest.

"3d. *The divergence* is greatest when the flame is most voluminous, or when the reflector is smallest. We cannot, then, (all other things being equal,) augment the *economical effect* of a reflector, without diminishing its *useful effect*: that is to say, without reducing its brilliancy or intensity, and consequently its range. The reduction of the volume of light within certain limits is particularly objectionable when it appertains to eclipse apparatus; in which case it limits the width of the luminous cone, and consequently augments the length of the eclipses. The same reduction applied to the crowns (foci) of reflectors composing a fixed light apparatus, may weaken the light in their intervals to such a degree as to produce *dead angles*, or become completely obscured to the observer beyond certain distances.

"It is further proper to remark that the horizontal divergence is not lost for *useful effect*, but that the divergence in the vertical sense only profits the navigator in the limited angular space comprised between the tangent at the surface of the sea, and the ray terminating at the distance of some miles from the light.

"Finally, there is, for the calibre of the lamp burners applicable to reflectors of given dimensions, and destined for the illumination of an equally determined range, *a maximum* beyond which prodigality of light ensues, and *a minimum* within which the illumination becomes insufficient."

A sideral apparatus of the same useful effect would be of a dimension which would render the construction of it very difficult, and very expensive, and would require, relatively, a very great consumption of oil. Neither could we supply it in a proper manner by the use of parabolic reflectors, except they were made expressly for the purpose of very small dimensions, to allow a sufficient number to distribute properly the light upon three-fourths of the horizon. It is evident, moreover, that that embarrassing combination would require a consumption of more than 200 grammes (7 oz.) of oil per hour.

The old light of Cette, (Herault,) provisionally illuminated by a catadioptric apparatus of 50 centimetres (19·69 inches) diameter, with a lamp of two concentric wicks, is easily seen in ordinary weather at the distance of 15 to 18 nautical miles, although it is given a range in the official table of only 12 nautical miles.

[Apparatus of the 3d order, larger model.]

The brilliancy of a catadioptric apparatus of the 3d order, one metre (39·38 inches) in diameter in the interior, illuminated by a mechanical lamp of double wick, burning 190 grammes (6 oz. 11·35 drachms) of oil per hour, has been found = 70 burners. I will suppose, moreover, that it embraces only four-fifths of the horizon.

To illuminate, by means of reflectors, the same angular space of 288°, with an effect of light *about equal*, it will be necessary to employ 14 parabolic reflectors (photophores) of 27·5c. (10·8 inches) diameter, each burning 35 grammes (1 oz. 3·8 drachms) of oil per hour. The brilliancy in the axis of each of the 14 reflectors will be about = 66 burners. The brilliancy in the interval, the least illuminated, will be = 36 burners. The useful effect will be represented by 14×62160=870240. But the useful effect of the catadioptric apparatus has been found to be = 1160000. In this case, notwithstanding the very great difference in the consumption of oil, the dioptric or lenticular apparatus is superior, in useful effect, to the catoptric apparatus. The economical effect of the first apparatus is represented by 6105, and the economical effect of the reflector is represented by 1776; comparison = 1 to 3·44: that is to say, without estimating the expenditure of oil by *unity of light*, the lenticular apparatus will be nearly three and a half times more advantageous than the catoptric apparatus. With regard to the effective expenditures of oil, they will be in the proportion of 190 grammes to 14×35 grammes, or of 1 to 2·6.

[Apparatus for a fixed light, 2d order.]

The brilliancy of a catadioptric apparatus of the 2d order, having an interior diameter of 1m. 40c., (4 feet 7·13 inches,) illuminated by a mechanical lamp of three concentric wicks, burning 500 grammes (17 oz. 10·5 drachms) of oil per hour, has been found to be = 264 burners. Let us suppose it only embraces three-fourths of the horizon. To obtain an effect about equal in an angular space of 270°, it will be necessary to employ at least 34 parabolic reflectors, having 50 centimetres (19·69 inches) diameter. The brilliancy in the axis of each of these 34 reflectors will be = 270 burners. But the lustres in the intervals are only = 148 burners. The useful effect of the catadioptric apparatus will be represented by 4120000, and that of the 34 reflectors by $34\times 103680 = 3525120$. The comparison between the absolute expenditures of oil will be $= \frac{34\times 42}{500} = 2{\cdot}86$ to 1; and the comparison of the quantity of oil expended by unity of light $= \frac{2469}{8240} = 1$ to 3·33; thus, in this last respect, the lenticular apparatus will be three and one-third ($3\frac{1}{3}$) times as advantageous as the catoptric apparatus.

[Revolving apparatus of the 2d order.]

The maximum brilliancy or lustre of the revolving apparatus of the 2d order, with 12 lenses, has been found to be = 1184 burners, as follows:

1st.	Brilliancy in the axis of a lens =	1080 burners.
2d.	Brilliancy in the fixed catadioptric zones =	104 "
	Total amount of brilliancy =	1184 "

And the minimum, corresponding to the eclipses, is equivalent to 104 burners.

To construct a catoptric apparatus possessing an equivalent effect, without multiplying beyond bounds the reflectors, (photophores,) it will be requisite, without doubt, to take those with diameters of from 55 to 60 centimetres, (21·66 inches to 23·63 inches,) but for want of sufficiently precise data as to their lustres, I will suppose the employment of reflectors of 50 centimetres (19·69 inches) diameter, which give in their axis a lustre equal to 270 burners. I will suppose, also, that the frame has six faces, each fitted with four of these reflectors. I will admit, lastly, as the succession of flashes ought to be the same in both systems, that the lenticular apparatus makes its revolution in six minutes, and the catoptric apparatus in three minutes. The maximum lustre of the catoptric system will be equal to $4 \times 270 = 1080$ burners. The amplitude of the lustres of the reflectors being, moreover, of 16 degrees at most, there will be 6 angles of 44 degrees each almost entirely obscured; and the length of these eclipses will be 22 seconds, while the length of the flashes will be only 8 seconds.

Without pressing further the comparison of the effects of the two kinds of apparatus, we will perceive, without doubt, the evident advantages of the dioptric or lenticular combination, which, in fine weather, will not present an *absolute eclipse* at a less distance than from 15 to 18 nautical miles. If we now consider the expenditures of oil, we will find:—

1st, That they are as $24 \times 42 : 500$, or :: 1 to 2.

2d, That the economical effects will be as 2469 : 10043, or as 1 to 4·07.

Thus the lenticular apparatus will be *four times* as advantageous as the catoptric or reflector apparatus.

I admit that this result might be modified by the employment of larger reflectors; but as their divergence would be less, the length of the flashes would be diminished, and consequently that of the eclipses would be augmented too much.

Let us remark, before proceeding further, that in employing 24 parabolic reflectors (photophores) of 50 centimetres (19·69 inches) diameter for such an apparatus, we reach the utmost possible limit, without admitting the employment of lanterns of a size beyond all proper bounds; and we may also affirm that very few of the catoptric lights, considered as lights of the *first order*, equal the lenticular lights of the same character of the *second order.*

[Apparatus of the 1st order.]

With the view not to multiply unnecessarily the comparisons, I will omit the details relative to the first order of the catadioptric combination, which is the most advantageous; and I will suppose, in consequence, the lenticular apparatus fitted in its accessory part with 11 zones of fixed mirrors. Now, we have found that the total lustre or brilliancy of an apparatus of that kind is equal in all its azimuths to 480 burners. But it will be practically impossible to obtain a like effect in the catoptric system, without having recourse to the employment of 36 reflectors, with apertures (diameters) of 60 centimetres, (23·63 inches.)

The difficulty becomes still greater if it be necessary to attain, with these parabolic reflectors, the effect of a revolving lenticular light with 8 large lenses, the lustres or flashes of which exceed 4000 burners of the Carcel lamp.

Let us limit ourselves, then, without entering into more full details, to the observation that the economical effect of a fixed light of the first order, illuminating $\frac{3}{4}$ths of the horizon, is to the economical effect of a light composed of parabolic reflectors ("photophores") of 50 centimetres (19·69 in.) diameter, as 10·080 to 2·469, or as 4·08 to 1: that is to say, that the first will be (as to the expense of oil only) four times as advantageous as the second.

[Apparatus for lights varied by flashes.]

I will only refer here to the apparatus for lights varied by flashes, (otherwise called of short eclipses,) for the purpose of remarking that the catoptric or reflector system is not susceptible of producing, without great difficulty, that combination which unites to the permanence of fixed lights the advantage of presenting a very decided character.

Sec. 2. *Expenses of first establishing and of maintaining lighthouses.*—So far, I have compared the economical effects of the different kinds of apparatus only with reference to the expenditures of oil; but it will not fail to be objected that the advantages which I point out in favor of the lenticular system ought to be very greatly diminished in a fiscal point of view, in consequence of the high price of the apparatus, and the excess of keepers necessary to their service. To appreciate the value of that objection, I will compare several lights of both systems, taking into the account all the expenses to which they could be subjected, and for the first example I will take the harbor lights.

HARBOR LIGHTS.

A harbor light, placed at the entrance to a port, being often exposed to the force of the sea, ought (to insure proper attendance, &c.,) to be erected securely in a bronze lantern, fitted upon the summit of a small tower constructed of masonry, and sufficiently spacious for the purposes of illumination and attendance at all times, and in every description of weather.

That being established, we may state the expenses for first establishing for both systems, (in France,) as follows:—

1. *Small "Sideral" Light.*

Small tower, in masonry, - - - - - -	5000 fr.
Octagonal lantern, 1m. 40c. (4 feet 7·13 inches) in diameter,	2650
"Sideral" reflector, with subsidiary pieces, - - -	500
= $1528·12.	8150
Interest at 5 per cent., - - - - - - - -	407 fr.
Annual expense of the service, - - - - - -	800
= $226·31.	1207

2. *Catadioptric Harbor Light (smaller model.)*

Tower and lantern, - - - - - - -	7650 fr.
Catadioptric apparatus, - - - - - - -	1531
= $1721·43.	9181
Interest at 5 per cent., - - - - - - -	459 fr.
Annual expense of the service, - - - - - -	800
= $236·06.	1259

The useful effect of the "sideral" (reflector) light having been found equal to 68400—

Its economical effect will be represented here by $\frac{68400}{1207} = 57$.

The useful effect of the catadioptric light, illuminating $\frac{3}{4}$ths of the horizon, has been found to be equal to 137700.

After the same manner, its economical effect will be $\frac{137700}{1259} = 109$.

The comparison of the economical effects of these two will be, then, in the proportion of 57 to 109, or 1 to 1·91.

Then, besides the advantage of a double lustre or brilliancy, the catadioptric apparatus, in an economical point of view, is nearly twice as advantageous as the catoptric apparatus.

Lights of the third order.

It is difficult to establish a precise comparison between the fixed lights of the 3d order in the old and in the new system, because we cannot obtain with the ordinary parabolic reflectors a passably equal distribution of light, without multiplying these reflectors to such a number as would require a much greater expenditure of oil than could be allowed for lights of that class.

I will merely observe that I have every reason to believe, from the indications contained in the table of lighthouses in the United States, that among all the lights of that country illuminated by reflectors, the diameters of which do not exceed sixteen English inches, there are very few whose useful effect is superior, or even equal to, that of a catadioptric light of the 3d order, larger model.

[Revolving lights of the second order.]

1*st. Catoptric Light.*

In the comparative examination of the useful and economical effects of the two systems of maritime illumination, I have supposed the revolving catoptric apparatus of the 2d order, composed of 24 parabolic reflectors of 50 centimetres (19·69 inches) of aperture distributed equally upon the six faces of a prismatic frame. I will suppose, also, that the lantern is 3 metres (9 feet 10·14 inches) in diameter, the same as required for a lenticular apparatus of the 2d order, but with a little less height. I will admit, moreover, the same perfection in the works: that is to say, that the frame and sashes, constructed of iron, are covered with bronze exteriorly; and that the roof or dome of the lantern is of copper, the glazing of glass of 8 to 10 milimetres (0·39 to 0·31 in.) in thickness, &c.

With regard to the buildings, the only remarkable difference will consist in, that the catoptric lighthouse will require room to lodge two keepers, while I will estimate for three in the lenticular lighthouse. That being stated, the necessary expenses to be incurred in the first system may be approximately estimated as follows:

Lighthouse tower, &c.,	50,000 fr.
Octagonal lantern, 3 metres (9 ft. 10·14 inches) in diameter, dressed in bronze,	10,500
Illuminating apparatus, consisting of 24 reflectors, 50 centimetres (19·69 inches) in diameter, revolving frame, rotary machinery, &c.,	12,500
Total first cost,	73,000
= $13,687·50.	
Interest at 5 per cent.	3650 fr.
Annual expense of the service, estimating the oil at the highest price,	5000
Total annual expense,	8650
= $1621·87.	

2*d. Revolving lenticular apparatus of the second order.*

Lighthouse tower, &c.,	60,000 fr.
Lantern and subsidiary fixtures,	12,500
Catadioptric lenticular apparatus and mechanical lamps,	33,000
Total first cost,	105,500
= $19,781·25.	
Interest at 5 per cent.,	5275 fr.
Annual expense of the service,	5800
Total annual expense,	11,075
= $2076·56.	

The useful effect of 24 parabolic reflectors of 50 centimetres (19·69 in.) diameter, will be equal to $24 \times 103680 = 2488320$.

The economical effect will be represented by $\frac{2488320}{8650} = 288$.

The useful effect of a lenticular light of the 2d order, with 12 revolving lenses, has been valued at 5021467.

The economical effect will then be represented by $\frac{5021467}{11075} = 453$.

The economical effects of these two lights will then be in the proportion of 288 to 453, or of 1 to 1·6. From whence it results definitively, that the lenticular light of the second order will be *more than one and a half times* as advantageous as the catoptric light, which we may, without doubt, consider as being of the first order, and the useful effect of which, nevertheless, could not be equal to but *the half* of the useful effect of the first.

Lights of the first order.

I find myself arrested in the attempt to make a comparison of the catoptric and dioptric lights of the first order, for the reason that we could not, without increasing beyond all proper limits the number of reflectors and the dimensions of the lantern, construct a catoptric apparatus to produce a sufficiently powerful effect to be assimilated to a dioptric apparatus of the first order. I mention this in this place merely that it may not be forgotten.

From the preceding details we may conclude:—

1st, That the lights fitted with the dioptric apparatus present a variety in their power and in their effects, and may be made to produce an intensity of lustre which renders them of an interest, in a nautical point of view, incontestably superior to those fitted with the catoptric apparatus.

2d, That if we take into account the first cost of construction, and the expense of their maintenance, we will find, in respect to the effect produced, the new system (dioptric) is still from *once and a half to twice as advantageous as the old.*

FACILITY AND SECURITY OF THE SERVICE OF THE LIGHTHOUSES OF THE OLD AND NEW SYSTEMS.

After having balanced the advantages relative to the two systems of lights in view of their useful and economical effects, I ought to consider them with reference to their security and the facility with which they are served.

I will reproduce, upon this subject, the observations inserted in a memoir of the 20th of April, 1830, in which I replied to the questions which were addressed to me by the government of Sweden and Norway, in relation to the necessary measures to be taken to improve the lighting of its maritime coasts.

"The service of lenticular lights is, in the aggregate, less laborious than that of the reflector lights. The first demand at all times during the night the unremitted attention of the keeper. If, for example, the central lamp should become extinct during the absence of the keeper from the lantern, or while he is asleep, the horizon of the light would remain some hours plunged in total darkness, and the greatest objection which has been urged against our new system of illumination is the fear of such accidents. Happily, an experience of *seven years* has dissipated that fear, and the lenticular lights have been distinguished up to this time by the regularity of their service. However, every precaution has, besides, been taken to replace promptly the lamp or its burner in case of extinction. The extreme simplicity of the day duty compensates the keepers for that to which they are subjected during the night. To snuff and replace the wicks, renew the oil, sweep the chambers of the lantern and the stairs of the tower, dust the apparatus, and sometimes wash with a little spirits of wine the tarnished spots upon it, and, lastly, to wipe dry the glass of the lantern—such is the principal daily duty which is divided between the keepers of the new lights, and which rarely occupies them more than two hours."

Opinions thus expressed *fifteen years since*, based upon an experience of seven years, have been greatly strengthened up to the present time, embracing a period of *twenty-two years* since the establishment of the Cordouan light, and sustained by the results daily offered of more than *one hundred* lenticular lights of the three first orders, established along the coasts as well of France as of different foreign powers.

In this important point of view, then, the question seems to be irrevocably settled, and I will only add a few considerations relative to the application, more or less extended, which may be made of the new system of illumination to the vast maritime coasts of the United States.

1st, It has been objected that it would require too great sacrifices to be made to procure in that country keepers possessing the amount of intelligence requisite for the superintendence of lenticular lights.

2d, That, from distant points or stations, the necessary repairing and renewing of the mechanical lamps would be attended with great difficulty.

I will reply, with regard to the keepers, that the difficulty of obtaining proper persons to fill these subaltern stations appears to be most singularly exaggerated. In France they belong almost always to the class of *ordinary mechanics*, or laborers, who make from 1·50 francs to 2·50 francs (27 to 46 cents) per day.

Eight or ten days will suffice, ordinarily, to instruct a light keeper in the most essential parts of his duty, receiving lessons from an instructor conversant with all the details of the service; and two instructing officers will be sufficient to prepare keepers for all the lenticular lights which could be successively established upon the coasts of North America. The information once imparted, would never be lost; and these officers might, besides, be aided by foremen or assistants, who could supply their places in case of necessity. In defence of this assertion I will cite the example of the administration of Norway and Sweden, which, after having obtained the assistance of a French agent to put up the apparatus of the two first lenticular lights, which were sent from Paris in 1832 and 1836, has provided since, without any foreign assistance, for the placing, as well as the organization of the service, of all the lights of the new system which it has successively established.

With reference to the eventual repairs of the mechanical lamps, it is to be considered—

1st, That, in consequence of the great strength of the pieces of which the new model of mechanical lamps are composed, they will perform well for a number of years without requiring anything more than a proper attention to their cleanliness.

2d, That the ordinary assortment of a dioptric lighthouse comprises three of these lamps, which afford a sufficient guarantee against the chances of accident; and, besides, we may, by increasing a little the mean expense, increase the number to *four* under some circumstances, as an exception to the general rule.

3d, That the repairs of the implements under discussion may be easily made by all the clock or watchmakers, or other mechanicians, to whom we have recourse for repairing the revolving machinery of lighthouses.

I conclude with the remark, that if it be determined to multiply the application of the new system of maritime illumination in the United States, it seems to me that it will be expedient to *engage one of the foremen employed in the manufactory of our mechanical lamps to go to, and to remain in the country for several years.* By that measure, which would be attended with very little expense, all the difficulties which might present themselves at first in establishing lenticular lights would be removed, and the perfect regularity of the service of these new establishments would be insured.

LEONOR FRESNEL.

Paris, 31st December, 1845.

Report of Professors PIERCE *and* LOVERING, *of Harvard University, on Fresnel's Dioptric Apparatus for Lighthouses. February,* 1846.

To the President of the Boston Marine Society, the undersigned respectfully submit the following Report upon the Sea Lights exhibited by I. W. P. LEWIS, Esq.

We have carefully examined these lights, and find them to be identical with Fresnel's Catadioptric Lights, which are well known to European navigators, and which, after repeated and earnest investigations by men of the highest scientific character, and by those practically familiar with the subject of lighthouses, have been approved and adopted by the principal maritime powers of Europe, viz. France, Holland, England, Sweden, Denmark, Spain, Sardinia, and Naples.

They have, from the time of their introduction, been gaining the favor of the world, and there are now two hundred lighthouses furnished with them, and there is no complaint of their inadequacy to the wants of navigation. On the contrary, the universal testimony is that of unequivocal and decided approbation, and among the witnesses we find the names of two of the most accomplished officers of our own Navy, Lieuts. Blake and Gedney, and a distinguished officer of the Topographical Corps, Captain W. H. Swift.

Impressed with the deep importance of this subject to the welfare of commerce and the safety of the mariner, we have devoted much time to our own examination of the lights, and having no desire to arrive at one result rather than another, we have been subject to no bias in the investigation; our conclusions must therefore be regarded as those of an entirely independent authority, and it will be seen that they do not differ materially from those of the Bell Rock Committee, appointed by the British Board of Commissioners of Northern Lighthouses to investigate these lights, and who, under the guidance of Sir David Brewster, devoted three years to this important examination. The executive member of this committee, and the one who arranged all the apparatus, was Robert Stevenson, Esq., whose official prejudices (as Chief Engineer of the Northern Lighthouses) were known to be strongly in favor of the old system of reflectors.

Our conclusions are also the same with those of Mr. Alan Stevenson, (who has succeeded his father as Chief Engineer,) and with those of Capt. Drummond, the inventor of the Drummond Light, and of Mr. Barlow, and of Fresnel himself.

The advantage of Fresnel Lights over the Reflectors is obvious and easy to be understood. It consists, primarily and simply, in catching those portions of light which are lost in the system of illumination by Reflectors, either because such portions pass too high into the upper regions of the air, or because they pass too low, and strike the earth at a short distance from the lighthouse. The light which is thus caught is thrown into a direction sufficiently near the horizon to become useful to navigation. The gain over the reflector is precisely similar in character to that of the reflector over the unaided light, and the light of the refractor or lens bears about the same ratio to that of the reflector which that of the reflector bears to the unaided light. Thus, $\frac{29}{30}$ths of an open light must be lost, and only $\frac{1}{30}$th would be practically useful to navigation, but the addition of a reflector of the best model and finish reduces the loss to $\frac{5}{6}$ths of the whole amount of light, and renders $\frac{1}{6}$th of the light practically useful. But the substitution of the Dioptric Apparatus reduces the amount of lost light to $\frac{1}{6}$th of the whole amount of light, and renders $\frac{5}{6}$ths of the light available: in other words, the serviceable portion of the open light is about $3\frac{1}{3}$ per cent., that of the best reflector is 17 per cent., and that of the Dioptric apparatus is 83 per cent. of the whole amount of light generated. This enormous superiority of the Dioptric apparatus is its characteristic feature, and constitutes the strong and unanswerable argument in its favor. The Dioptric light, under all circumstances, whether exhibited as *fixed*, *revolving*, *flashing*, or *intermittent*, gives *five times* the amount of light of the reflector for the same consumption of oil. (See Note.)

A secondary consideration of no little practical importance is the circumstance that the "*Fixed*" Dioptric Light is much more perfect than the "*Fixed*" Light by reflectors, because its light is diffused *equally in every direction.* This is not the case with the reflector, for if ten reflectors, for instance, of the best model, are arranged upon a circular stand as a fixed light, each lamp illuminates only a small portion of the horizon in front of its reflector. Hence not more than one lamp (of the ten) can be seen in any direction, and there are large intervals in which no lamp can be seen. The dark spaces are even larger in this case than the illuminated portions, so that only 42 per cent. of the whole horizon is lighted, and less than 20 per cent. is lighted with the full power of a single lamp. The Dioptric light, on the contrary, is seen in every direction with the same brilliancy. The only objection to the Dioptric light arises from the dependence upon a single lamp, fed by a mechanical contrivance. Any injury to the valves might extinguish the lamp, and it would take about twenty minutes to relight it. Experience seems, however, to have shewn that this danger is more speculative than real, for there is no public complaint of any such occurrence, nor are we informed of its having happened. We are also of opinion that this danger might be avoided by the substitution of a large fountain lamp for the mechanical lamp.

Our attention has incidentally been drawn to the great inferiority of the reflectors generally used upon the American coast, by which the amount of available light is much less than one-half of that which would be given by a good reflector of suitable dimensions. The gain of the Dioptric light over such a reflector cannot be less than in the ratio of ten to one. Hence it is that Mr. Lewis has been able to exhibit the accompanying schedule of our northern lights, in which he fairly proposes to furnish nearly three times the amount of light with only about one-third of the present consumption of oil. With about 8800 gallons of oil, he gives nearly three times the amount of light actually furnished with 26,400 gallons, and as much light as, on the present wasteful system, would be derived from the consumption of 78,000 gallons of oil. In this proposition there is no mystery or deception, nor any reasonable room for doubt or distrust. The principles of this gain are admitted by all scientific men as incontestable, and admit of being tested by any man of good sense and decent acquirements.

We cannot close this report without expressing our deep sense of Mr. Lewis's thorough acquaintance with the whole subject of lighthouses, both theoretically and practically—of his openness and candor in every point of the investigation, and his anxious desire to aid us in arriving at the truth.

Most respectfully, your obedient servants,

Benjamin Pierce.
Joseph Lovering.

Harvard University, February 3d, 1846.

Note to Report.—This paper gives the result of our experiments, made for determining the comparative value of the Catoptric and Dioptric methods employed in lighthouses.

These experiments were carefully conducted, without any bias, and with no desire but to find the truth.

The apparatus was furnished by Mr. I. W. P. Lewis, and arranged by him in working order, in the spacious hall over the new depôt of the Boston and Maine Railroad.

Our plan has been to compare the reflector with a Carcel flame placed at a given height, and then compare the Carcel flame with the Dioptric light. When possible, the Catoptric and Dioptric lights have been brought into direct comparison as a kind of verification of the first result.

Although the number of our experiments has not been very great, we place considerable confidence in our conclusions, from the time and attention bestowed upon them, and a satisfactory correspondence between them and those which have been reached by men who have more fully investigated the subject in Great Britain.

Our examination extended to the following articles of apparatus, viz:—

1st. An Annular Lens of the 1st Order, with lamp of 4 wicks.
2d. An Annular Lens of the 2d Order, with lamp of 3 wicks.
3d. A Cylindric Refractor, of the 3d Order, with lamp of 2 wicks.
4th. The same varied by flashes.
5th. A Catadioptric series of the 3d Order, small model, with an Argand lamp.

6th. The same varied by flashes.

7th. A Catadioptric series of the 4th Order, with Argand lamp.

8th. The same varied by flashes.

9th. A Parabolic Reflector of silver plate, 21 inches in diameter, and 4 inches focal axis, lighted with an American Lighthouse lamp, with $\frac{3}{4}$-inch burner.

Our results are as follows:—

1st. The Annular Lens of the 1st Order is equal to the combined effect of 19 such Reflectors as are specified in No. 9 of the above enumeration. Its lamp consumes as much oil as 19 of the Argand burners of $\frac{3}{4}$-inch diameter, which are used in American Reflectors.

2d. The Annular Lens of the 2d Order is equal to 12 of these Reflectors. Its lamp consumes as much oil as 13 of the above $\frac{3}{4}$-inch Argands, which are used in American Reflectors.

3d. The Cylindric Refractor of the 3d Order, used as a *fixed* light, spreads a uniform light in every direction equal to 57 per cent. of the maximum effect of the above Reflector in its best direction. Its lamp burns as much oil as 6 of the above $\frac{3}{4}$-inch Argand burners.

4th. This Cylindric Refractor is varied by flashes, so as to send a flash 10 per cent. more powerful than the maximum flash from one of the above Reflectors.

5th. The Catadioptric series of the 3d Order, (small size,) shewn as a *fixed* light, spreads a uniform light in all directions equal to 25 per cent. of the maximum effect of the above Reflector. Its lamp burns as much oil as $2\frac{5}{6}$ of the above $\frac{3}{4}$-inch Argands.

6th. This Catadioptric series, varied by flashes, gives a flash 3 per cent. stronger than the brightest light from one of the above Reflectors.

7th. The Catadioptric series of the 4th Order, shown as a *fixed* light, spreads a uniform light in all directions equal in value to 12 per cent. of the maximum light which goes in the best direction from one of the above Reflectors. Its lamp burns as much oil as $1\frac{3}{5}$ of the above $\frac{3}{4}$-inch Argands.

8th. This Catadioptric series, varied by flashes, gives a flash 78 per cent as great as the maximum light that goes from one of the above Reflectors.

9th. The above-named 21-inch Reflector projects a beam of light equal in its best direction to 190 Argand burners of 1 inch diameter, with a flame $1\frac{1}{2}$ inches high. This maximum power is confined to about $3\frac{1}{2}$ degrees on each side of the axis. Its power is reduced, at the distance of $7\frac{1}{2}$ degrees from the axis, to 12 such Argand burners; accordingly the valuable light from such a reflector is confined to a range of about 5 degrees on each side of the axis. The mean effect of such a reflector, if averaged over a range of $7\frac{1}{2}$ degrees each side of the axis, is equal to 120 of such Argand burners.

Benjamin Pierce.
Joseph Lovering.

Note 4. Refer to the same authorities.

Note 5. Report to the British Parliament, 1845, before cited.

To be Continued.

JOURNAL

OF

THE FRANKLIN INSTITUTE

OF THE STATE OF PENNSYLVANIA

FOR THE

PROMOTION OF THE MECHANIC ARTS.

OCTOBER, 1849.

CIVIL ENGINEERING.

Contributions to Railway Statistics, in 1846, 1847, *and* 1848. *By* HYDE CLARKE, ESQ.

(Continued from page 175.)

No. 21.—*Agricultural Traffic.* The preceding sections show the services rendered to agriculture by railways. The accommodation may be classed under the following heads:—

Brought to the Farm.

	Tons.
Building materials, draining tiles, hop-poles, &c.,	350,000
Manures, lime, bones, sand, &c., - -	300,000
Hay, turnips, oil-cake, &c., for feeding stock,	——
Clover and other seeds, - - -	15,000
Salt, - - - - - -	——
Coals, - - - - - -	4,500,000
Lean stock, 100,000 cattle; 250,000 sheep.	
Implements and iron, - - -	——
Fish, - - - - - -	10,000
Foreign provisions and groceries, - -	——

The whole weight carried by railway to the farms cannot be less than 6,000,000 tons, on which a very great saving has been effected.

Produce carried to Market.

Cattle, -	400,000 head.	Horses, -	——
Calves, -	——	Provisions,	700,000 tons.
Sheep, -	1,750,000 "	Grain, -	——
Swine, -	100,000 "		

Other produce, hides, hams, wool, hops, malt, ale, beer, cider, perry, hay and animal food, timber, bark.

No. 22.—*Parcels Traffic.* This is a well-paying branch of revenue, connected with the passenger traffic, and has been latterly much improved. The accounts do not, however, show the full extent of the parcel traffic, as a great portion of it is still included in the general account for goods, the carriers making up parcels as goods. The results are therefore minimum results.

The total receipts in each year are as follows:—

	1845.	1846.	1847.
Detailed returns,	£156,910	£208,952	£266,043
Add for half-years omitted,	——	16,500	1,100
Add for companies omitted,	40,000	8,000	2,400
Total,	£198,910	£233,452	£269,543

The returns of parcel traffic are the only returns which show any improvement; the others afford less information in each year.

From the above amounts a correction has to be made for passengers' luggage charged in excess, included in the parcels returns. This is usually about 6 per cent of the gross returns; but as it is deducted in some cases, 5 per cent. is a sufficient compensation. It must be observed that in some cases parcels are included in the goods return.

The South Devon return includes receipts for telegraphic messages.

Making the above correction, the net receipts for parcels will be—

1845.	1846.	1847.
£186,000	£222,000	£255,000

It is not necessary to give the detailed charges for parcels, as they include sometimes charges of booking and delivery.

In 1844–5, the number of parcels enumerated was 362,202, and the receipts £14,034, which gives an average rate of 9·29*d.*, or a little more than 9¼*d.* per parcel, or rather more than 28 parcels per pound. Taking this as the average, the total number of parcels carried in 1844–5 would be about 4,500,000.

In 1845–6, the number of parcels enumerated was 384,353, and the receipts £11,559, which gives an average rate of 7·2*d.*, or nearly 7¼*d.* per parcel, or more than 33 per pound. Taking this as the average, the total number of parcels carried in 1845–6 would be about 7,400,000.

In 1846–7, the number of parcels enumerated was 530,641, and the receipts £8685, which gives an average of 3·9*d.*, or nearly 4*d.* per parcel.

It is questionable, however, whether the average is so low in any of the years, as the London and North Western, which has so large an amount of the parcels traffic, is not taken to form part of the average. It is, however, certain that the average rates for the conveyance of parcels have been much reduced. A fair average will be 18 parcels per pound for 1844–5, 19 for 1845–6, and 20 for 1846–7. This will give the whole number of parcels carried by railway in each year as under—

1845, - - - -	3,350,000
1846, - - - -	4,200,000
1847, - - - -	5,000,000

The number of parcels carried both ways to each town may be reckoned thus:—

London,	1,500,000	Brighton,	60,000
Manchester,	300,000	Sheffield,	60,000
Liverpool,	200,000	Preston,	50,000
Leeds,	200,000	Edinburg,	40,000
Birmingham,	200.000	Hull,	30,000
Glasgow,	100,000	Exeter,	20,000
Bristol,	100,000	Newcastle,	20,000
York,	100,000	Carlisle,	20,000
Bath,	100,000	Chester,	10,000
Cambridge,	100,000	Dundee,	10,000
Southampton,	100,000	Ipswich,	10,000
Dover,	80,000		

In consequence of new arrangements made by the companies, a great increase of business has taken place in the carriage of booksellers' parcels. There is a great tendency in the parcels traffic to increase, in consequence of the extension of the supply of the local grocers, linen drapers, &c., from London and the great towns, for it is well known that, instead of taking stock a few times yearly, they now receive frequent supplies.

The chief parcels traffic is on the following lines:—

	No. of parcels.	Receipts.
London and North Western,	2,000,000	£104,738
Great Western,	700,000	34,155
Midland,	600,000	28,986
Eastern Counties,	480,000	16,669
Lancashire and Yorkshire,	400,000	5,225
York and North Midland,	300,000	13,476
York and Newcastle,	300,000	8,724
London and South Western,	200,000	10,629
London and Brighton,	200,000	9,596
South Eastern,	200,000	8,793

No. 23.—*Mails.* The total receipt detailed in 1845 was £77,000, to which has to be added for omissions £23,000, making a gross total of £100,000.

The total receipt detailed in 1847 was £105,872, to which has to be added for omissions £25,000, making a gross total of £130,000.

No. 24.—*Miscellaneous Goods.* Among other articles enumerated in the returns, are furniture and vitriol.

In the year ending 30th June, 1846, there was carried on the Manchester and Bolton, 256 tons of furniture; on the South Western, 325 tons (half-year); and on the Brighton, 2923 tons. The receipts were, Manchester and Bolton, £128, and Brighton, £4687.

In the year ending 30th June, 1847, there was carried on the Brighton Railway 4669 tons, the receipts for which were £6660.

The carriage of furniture is now considerable, the railway being preferred to the canal for long distances. The rates per ton per mile are high. On the Manchester and Bolton the rate is 12*d.*, on the London and South Western 7·26*d.*, and on the London and Brighton 7·49*d.*

Vitriol is carried on the Newcastle and Carlisle Railway. In the year ending 30th June, 1846, 17 tons, bringing £11, and in 1847, 62 tons, bringing £39. Vitriol is classed as dangerous, and the rate for carrying it is $6\frac{3}{4}$*d.* per ton per mile.

The total tonnage in each year was as follows:—

1844.	1845.	1846.	1847.
9,823,533	12,522,976	15,871,179	16,699,382

The following shows the distribution of the traffic in 1847, in tons:—

Coals and Coke,	8,900,000
Ironstone,	600,000
Iron,	300,000
Iron Dross,	110,000
Copper and Tin,	23,000
Limestone and Lime,	300,000
Building Stones,	600,000
Sand,	37,000
Ballast,	36,000
Bricks and Tiles,	5,000
Miscellaneous Minerals,	300,000
Fish,	43,000
Grain,	300,000
Provisions,	400,000
Manure,	40,000
Goods, Timber, and Sundries,	4,705,382
Total,	16,699,382 tons.

To show how small this traffic is relatively to the total carried, the following items in the consumption of the people of this island, in tons, may be noted:—

Corn,	3,000,000
Potatoes,	3,000,000
Sugar,	300,000
Tea, Coffee, and Tobacco,	50,000
Malt,	400,000
Spirits,	100,000
Paper,	40,000
Soap,	90,000
Candles,	100,000
Cotton Goods,	250,000
Woolens,	100,000
Linens,	100,000
Iron,	1,600,000
Glass,	40,000
Coals,	30,000,000
Salt,	650,000
Timber,	2,000,000
Total,	41,720,000 tons.

This enumeration of 41,720,000 tons is under the mark, and only gives the total consumption of this island, reckoning the articles as only carried one way, and not including many articles of agricultural produce: manures, leather (60,000), fish, stone, lead, copper, earthenware, oil (60,000), fruits, &c.; bark, 50,000; dyestuffs, 70,000; hemp, 50,000; cabinet woods, 30,000; rice, 20,000; tar, 20,000; turpentine, 20,000, &c. The railways at present do not carry more than a fourth of the traffic of the country, if so much.

No. 26.—*Average Rate and Mileage.* It is of some importance for engineers to know the average distance that each class of produce is carried, and the average receipts, which are far below what is believed.

Passengers.—The average mileage of all the passengers in 1847 was 16 miles,* and the average receipts 2*s.* The average receipt on the London and North Western is 4*s.*; Great Western, 4*s.* 9*d.*; Midland, 2*s.* 7*d.*; South Eastern, 1*s.* 6*d.*; Brighton, 2*s.* 4*d.*; Eastern Counties, 3*s.*; South Western, 3*s.*; and Lancashire and Yorkshire, 1*s.* 4*d.*

Beasts.—The average receipts for beasts on the London and North Western is 42*d.*, miles 57; Eastern Counties, 68*d.*, miles 75; Great Western, 34*d.*, miles 45.

Sheep.—London and North Western, 10*d.*, miles 70; Eastern Counties, 9*d.*, miles 75; Great Western, 10*d.*, miles 66.

Swine.—London and North Western, 18*d.*, miles 120; Eastern Counties, 6*d* , miles 58; Great Western, 12*d.*, miles 75.

Coals.—York and Newcastle, 16*d.*; Stockton and Darlington, 18*d.*; Midland, 27*d.*; London and North Western, 20*d.*

Ironstone.—Ballochney, 9*d.*; Taff Vale, 28*d.*, miles 25.

Limestone and Lime.—Midland, 22*d.*; Newcastle and Carlisle, 20*d.*, miles 16; York and North Midland, 14*d.* miles 9.

Building Stone.—York and North Midland, 24*d.*, miles 24; Midland, 20*d.*; Newcastle and Carlisle, 22*d.*

Sand.—Bodmin and Wadebridge, 24*d.*, miles 8.

Fish.—York and Newcastle, 21*s.*, miles 50; Norfolk, 13*s.*, miles 68; Whitby and Pickering, 9*s.*, miles 25.

Parcels.—Average of enumerated lines, 3·9*d.*

Horses.—Average of all lines, 16*s.*

Carriages.—Average of all lines, 25*s.*

No. 27.—*Horse Traffic.* The charge for horses per mile is, London and North Western, 3*d.*; Great Western 5·4*d.*; Midland, 4·25*d.*; Eastern Counties, 3·6*d.*

Many day-tickets are taken out for horses on the London and North Western and other lines, by persons going out hunting.

No. 28.—*Carriage Traffic.* The average charge per mile is, on the London and North Western, 4*d.*; on the Great Western and Midland, 6*d.*

No. 29.—*Dog Traffic.* Dogs are enumerated only in a few returns. The average rate per mile is ½*d.* The number carried in 1847 on the South Devon line was 1086, £34; on the Maryport and Carlisle, 336, £51; and on the Whitehaven, 230.

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* See a valuable paper by Mr. Wyndham Harding, read before the British Association, at Swansea, and since re-published.

No. 30.—*Carrying-Stock.* The following is an enumeration of the carrying-stock of the London and North Western Railway in 1848, suitable for special traffic:—Horse boxes, 210 (horses carried, 27,715); carriage trucks, 217 (carried 8790); bullion vans, 9; post offices, 8; ditto tenders, 13; milk trucks (north division), 2, convict van, 1; cattle wagons, 495 (cattle, 161,171); sheep wagons, 117 (sheep carried, 399,998); coal wagons, 653 (440,000 tons); timber trucks, 12; powder magazines, 4; iron trolléys, 4.

No. 31.—*Manchester and Sheffield.* The following, communicated by the kindness of Mr. Meadows, Secretary of the Company, gives some particulars as to the traffic of the Manchester, Sheffield, and Lincolnshire Railway:—

Analysis of Merchandize Traffic.

Date.	Coal.	Stone.	Sheffield Goods.	Flour and Grain.	General Goods.	Total.
1848.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
March,	12,334	6,176	1,791	1,159	5,550	27,010
April,	9,689	7,530	1,884	1,618	4,698	25,419
May,	8,673	8,561	2,262	2,663	5,443	27,602
Total,	30,696	22,267	5,937	5,440	15,691	80,031

Civ. Eng. & Arch. Journ., Dec. 1848.

On the Component Parts of the Crust or Fur in Boilers. By Mr. Wm. West. *Read before the West Riding Geological and Polytechnic Soc.*

It has been common to speak of bicarbonate of lime, or carbonate of lime dissolved in water by excess of carbonic acid, according to the opinions on a theoretical point of authors describing the same substance, as yielding the crust or "fur" of steam boilers; and either to deny or overlook the share which *sulphate* of lime has in the formation of this troublesome deposit. Among those who have gone so far as to deny the existence, or, at least, the practical importance, of sulphate of lime in these crusts, is Dr. Ritterbandt, the proprietor of a very ingenious, and, I believe, in some situations, a very effectual patent method for preventing incrustations of the carbonate, by introducing chloride of ammonium into the boiler. At that temperature carbonate of ammonia is driven off, and the highly soluble chloride of calcium remains, in place of insoluble carbonate of lime. I have, however, so often found in these crusts not merely a notable, but a considerable, portion of sulphate of lime, that I have on different occasions, when my subject required, called attention to its presence, and expressed an opinion, which I have found much to confirm, that it is even more troublesome and mischievous than the carbonate alone.

The specimen now treated of was formed, under somewhat peculiar circumstances, in a low-pressure boiler. It contains not a trace of carbonate, yields not a bubble of effervescence with acids, and a portion dissolved in a large quantity of water yields, with chloride of barium, a quantity of sulphate of barytes, closely equivalent to what it would furnish if pure anhydrous sulphate of lime. It contains a little oxide of iron. It is not the curious salt discovered by Professor Johnstone, containing half an atom of water to each atom of sulphate of lime; for ten grains, finely powdered, lost by exposure to a red heat only three-tenths of a grain—less than a quarter of an atom of water, and, therefore, hygrometric or accidental; and the sulphate is essentially anhydrous. The deposition of sulphate of lime from a solution, far below saturation, takes place in the manner which I described some years ago in the Journal of the Royal Institution. As each bubble of steam is disengaged during brisk ebullition, the sulphate of lime, of course, separates; for its re-solution time would be required, but before that can take place many other particles are separated, and these rapidly cohere into portions large enough to subside, and to resist yet more the solvent power of the water.

I have elsewhere, and on other occasions, stated my belief that though gypsum, in its hydrous and ordinary crystals, is a softer mineral than calc spar, yet that boiler crusts containing much sulphate of lime are harder than those composed wholly or chiefly of carbonate. The present specimen curiously confirms this opinion. I am assured by the workmen, that not only was it with difficulty removed by the tools usually employed for such purposes, but that even the "sate," or hard chisel, used for cutting cold iron, is sometimes broken or turned by this crust. Ibid. June, 1849.

The Floating Railway Bridge for the Frith of Tay.

This novel and extraordinary piece of naval architecture has had her engines fitted at Mr. Napier's dock, at Lancefield. She lately made an experimental trip down the river to Greenock and back. The vessel is of iron, 175 feet long, 34 feet broad, and 10 feet deep, the bottom being a very flat curve; both ends are alike and quite square, so as to abut against the quay, and receive the trains on deck from either end. The deck is flush and clear fore and aft, and on it are three lines of rails, so as to enable it to take the longest train likely to require it. The steering wheel is amidship, elevated between the paddle-boxes, and connected with the rudders at each end by long chains; as the vessel will not be turned, these rudders will, of course, be used alternately, as either end becomes the stern. There are two engines entirely independent of each other, and ins'ead of a shaft connecting the paddles, each is moved solely by one engine, by which means extraordinary command is obtained over the movements of the gigantic machine, independent of the rudders. The diameter of the cylinders is 56 inches, with a 3 feet 6 inches stroke; the valves work with great ease, and each engine is 100-horse power. The valve gear is on deck; there are two eccentrics which are thrown alternately in and out of gear, as either end of the vessel becomes in turn the head. The boilers are amidships, with a clear space all round for facility of cleansing and repairs. She draws but little water, made eight knots per hour, and is expected to be in operation in two months. There are two small extra pumps for supplying the boilers, in case of the water running low, and every precaution appears to have been taken to prevent accident. Ibid.

Description of the Camden Station of the London and North Western Railway. By Mr. R. B. Dockray, *M. Inst. C. E.*

In the first design of the railway, in 1833, this station was intended for the sole terminus of the line, and, after much discussion, thirty acres of ground were purchased, although that quantity was considered preposterously large. A very short time demonstrated the necessity for the establishment of the Euston Station solely for passengers; and fourteen acres were there secured, and ultimately covered with buildings. The whole station at Camden was then devoted to goods and cattle; and although in the original design great care was taken to anticipate the wants of the traffic, yet such has been the rapid development of the railway system, that in the space of ten years it has proved necessary to sweep away almost every vestige of the original constructions, and entirely to remodel the station. These changes have been partly produced by the increase in the goods traffic, which was first undertaken by the great carriers, who built large warehouses on the Company's land. The whole system has, however, been reformed, and the Company do all that business, and are responsible to the public for the due performance.

As the increase of the traffic progressed, the trains in the sidings frequently became of such length as to cause danger to the passenger trains; it therefore became necessary to alter the whole disposition, which has been so done, as now to give a length of double line of two thousand five hundred feet, for the goods wagons only, entirely clear of the main line.

Another reason for the alterations was the demand by the public for a more rapid rate of traveling; this demanded heavier and larger engines, and necessitated wider buildings and larger turn-tables; in fact, everything required to be re-modeled;—and the results of all these changes were shown in detail in the paper and the illustrating drawings.

The circular engine-house, one hundred and sixty feet diameter, to contain twenty-four engines and tender, with a central turn-table, forty-one feet in diameter, and an iron roof, was excellently described; as were also the other engine-houses, stores, warehouses, sheds, &c., with their appurtenances; and among the external works, the new wrought iron bridge, at Chalk Farm, on Mr. R. Stephenson's box-girder principle, and the wooden lattice bridge over the Regent's Canal.

The supply of water for the locomotive engines was then treated of at some length, and exhibited some curious anomalies. The only water that could originally be used, was taken from wells at Tring and at Watford; an attempt was, however, made to obtain a supply at Camden station, first from the Regent's Canal, and then by sinking a well down one hundred and forty-five feet into the chalk, or to a total depth of three hundred feet below Trinity high-water mark. The water from the sand stratum was excluded, and although only that from the chalk was pumped up, which ought to have possessed the same qualities as the water at Tring and Watford, derived also from the chalk, yet it was found to cause the locomotive to "prime," or flush water through the cylinders, with the steam, to such an extent as to seriously impede the progress of the trains. This was shown, by analysis, to arise from the excess of carbonate of soda contained in this well water, which there was an entire absence of in the waters of the wells at Tring and at Watford.

The well, therefore, became useless for the engines, but the water was so excellent for household and other purposes, that it has been employed for the general uses of the station, and for the hotels and houses belonging to the Company.

Some idea of the extent of the station was given by the statement, that the length of single line of railway, exclusive of the main lines, exceeded twelve miles. There were one hundred and twelve sets of points, one hundred and ninety-six turn-plates, and one hundred and ten cranes, varying in power from one ton and a half to twenty tons. The area of goods sheds was upwards of one hundred and thirty-five thousand superficial feet, and that of the platforms was thirty thousand feet.

The annual consumption of gas exceeded six millions of cubic feet.

The discussion that ensued turned chiefly on the causes of the excess of alkalinity in the water at that spot, and it was suggested that it might be owing to the rapid filtration of surface water through a crevice in the chalk upon which that well had been sunk; and, as a cure for the "priming," it was suggested to try a minute quantity of sulphuric acid to neutralize the alkali. There appeared, however, to be a question whether the water from the green sand was really completely excluded.—*Proc. Inst. Civ. Eng.*

Glasgow Prac. Mech. Journ., April, 1849.

Observations made on the Initial and Terminal Velocities of Trains in Descending Inclined Planes. By Capt. W. Moorson, *M. Inst. C. E.*

The observations were 82 in number, and were made during the ordinary passing of trains on the Waterford and Kilkenny Railway, the gauge of which is 5 feet 3 inches, over two adjoining inclines, each falling at the rate of 1 in 100 for upwards of 1½ miles, with a short intermediate level between them.

The speeds at which the descent was begun varied from 20 to nearly 44 miles per hour, and the loads varied from 32 to 94 tons.

One of the planes presented, for the greater part of its length, two curves of a radius of 1¼ and 1⅙ miles respectively, and the other plane was straight for part of its length, but contained a curve of 2½ miles radius. The general results in the more curved plane were, that initial velocities of 20 to 30 miles per hour, at the top of the plane, became terminal velocities of 24 to 28 miles per hour; and on the straighter plane, the same initial velocities became terminal between 29 and 31 miles per hour. Again, on the more curved plane, initial velocities between 30 and 40 miles per hour, became terminal at velocities between 29¾ and 31½ miles per hour; and on the straighter plane, the same initial velocities became terminal at 30¾ to 33½ miles per hour.

Initial velocities above 40 miles per hour were noted only upon the more curved plane, and became terminal at 30 to 31 miles per hour. There did not appear to be any constant proportion between the load in motion and terminal velocity; but the latter appeared to be dependant more upon initial velocity than upon the weight or character of frontage of the trains.

The general practical conclusion was deduced, that the question of gauge had little or nothing to do with terminal velocity derived from gravity, and that the views generally entertained by engineers during past years, of the great resistances experienced by trains at high velocities, were borne out by the observations recorded in the paper.—*Proc. Inst. Civ. Eng.*

Lond. Min. Journ., No. 721.

The Britannia Bridge over the Menai.

The abutments, on either side of the Straits, are huge piles of masonry. That on the Anglesey side is 143 feet high, and 173 feet long. The wing walls of both terminate in splendid pedestals, and on each are two colossal lions *couchant*, of Egyptian design, lifting their limestone foreheads in the face of every train. These lions, like the tube they adorn, are on a gigantic scale, each being 25 feet long, 12 feet high, though crouched, 9 feet abaft the body, and each paw 2 feet 4 inches. Each weighs 30 tons.—There is some intention of surmounting the central tower with a colossal figure of Britannia, 60 feet high. The towers for supporting the tube are of a like magnitude with the entire work. The great Britannia Tower in the centre of the Straights is 62 feet by 52 feet at its base; its total height from the bottom, 230 feet; it contains 148,625 cubic feet of limestone and 144,625 of sandstone; it weighs 20,000 tons, and there are 387 tons of cast iron built into it in the shape of beams and girders. Its province is to sustain the four ends of the four long iron tubes which will span the Straights from shore to shore. The total quantity of stone contained in the bridge is 1,500,000 cubic feet. The side towers stand at a clear distance of 460 feet from the great central tower; and again, the abutments stand at a distance from the side towers of 230 feet, giving the entire bridge a total length of 1849 feet, corresponding with the date of this present year of grace. The side or land towers are each 62 feet by 52 feet at the base, and 190 feet high; they contain 210 tons of cast iron.

Tubes of the Britannia Bridge.—The length of the great tube is exactly 470 feet, being 12 feet longer than the clear space between the towers, and the greatest span ever yet attempted. This additional length is intended to form a temporary bearing of 6 feet at each end, after they are raised into their places, until there is time to form the connexion between them across the towers. Their greatest height is in the centre 30 feet, and diminishing towards the end to 22 feet. Each tube consists of sides, top, and bottom, all formed of long, narrow wrought iron plates, varying in length from 12 feet downward. The direction in which these plates are laid down and riveted together is governed by the direction of the strains on the different parts of the tubes. They are of the same manufacture as those for making boilers, varying in thickness from three-eighths to three-fourths of an inch. Some of them weigh nearly 7 cwt., and are amongst the largest it is possible to roll with any existing machinery. In the sides the plates are 6 feet and 8 feet long, and half an inch thick; but the longest plates are in the bottom, being 12 feet long by 2 feet 4 inches wide, arranged in double layers. At the top they are 6 feet in length and 1 foot 9 inches in breadth. The connexion between top, bottom, and sides, is made much more substantial by triangular pieces of thick plate, riveted in across the corners, to enable the tube to resist the cross or twisting strain to which it will be exposed from the heavy and long continued gales of wind that, sweeping up the Channel, will assail it in its lofty and unprotected position. The rivets, of which there are 2,000,000,—each tube containing 327,000,—are more than an inch in diameter. They are placed in rows, and were put in the holes red-hot, and beaten with heavy hammers. In cooling they contracted strongly, and drew the plates together so powerfully, that it required a force of from 4 to 6 tons to each rivet to cause the plates to slide over each other. The total weight of wrought iron in the great tube is 1600 tons. The trains will pass through over the Straits at 100 feet above high water. Lond. Athen., June, 1849.

Accident at the Britannia Bridge.—A letter in a Liverpool paper, from Bangor, England, August 17th, 1849, says:—

"All hopes of raising the monster tube of this stupendous bridge to its final resting place, are, for the next two months at least, suspended. A few minutes before noon of this day, the lower part of the cylinder of the huge hydraulic press on the Anglesey side burst with a tremendous explosion, and in its descent to the tube, a height of 84 feet, fell with a terrific crash. The press was at work at the time, and had raised the tube about three feet during the lift this day; and had it not been for the precautionary means adopted, by packing and bricking under with cement as the tube was raised, the most dreadful consequences were inevitable. One of the workmen was precipitated from a rope ladder, running from the top of the tube to the recess in which the hydraulic machine was fixed; he was struck by the huge mass of iron in its descent, weighing nearly three tons, and now lies in a dreadfully crushed state. I fear that he cannot survive many hours, as the medical attendant on the works considers that, on an examination of his body, most of his limbs must be fractured, as well as suffering from dreadful internal contusions. This disastrous affair is to be attributed entirely to a defective coating of the cylinder, and the raising of the tube will consequently be delayed some time, until the completion and fixing of the new one in its place. The tube is now raised about 21 feet from its base."

Notice of Dr. Sleigh's Patent for Preventing Accidents on Railroads.

The first part of the invention consists in the application of oblique pressure to the rails, by means of a short lever of the second order, acting on a toggle or hinge joint, similar to that used in the Stanhope printing press, by means of which one person can, at will, command, instantly or gradually, a resisting force equal to many tons. Moreover, this is so constructed that the rails cannot be displaced or broken; for according to the principle of the revolution of force, a definite proportion of the force (depending upon the angle of the joint) will act at a right angle on the rails, holding them down; while a bar of iron only an inch square, called the guard, and which it would take 27 tons to tear asunder, protects them on the outside. Nor can the carriages be lifted off the rails by it, for the fulcrum of the lever will never have on it one-half the weight of the carriage, and that although 20 tons pressure be applied to the rails. It is proposed to attach this apparatus, which cannot cost more than £10 for each train, to the last carriage; for when a train is suddenly stopped by an impediment in front, it is the last carriage, retaining the momentum it had acquired, (the front carriage being deprived of it,) dashes on, smashing those in front; but when the last carriage is the first stopped, after the actual moving power is cut off, this can never occur.

This invention does not entail the necessity of making any alteration in the rails or carriages, except the luggage one, (to which the apparatus may be attached for a mere trifle,) nor is it intended to supersede the use of the ordinary brakes on ordinary occasions; its great merit being that it is adapted to do that which the means at present employed are incapable of accomplishing. As tested by the model, the invention is perfectly successful and extremely well adapted to the purpose for which it is designed; but its efficacy, when applied in its full force with the enormous power and speed of a train of carriages opposed to it, of course remains to be proved.

Ibid.

On the Employment of High Pressure Steam, Working Expansively, in Marine Engines. By Mr. J. Seaward.

This communication was described to be the substance of a reply, by the author, to questions asked by the Secretary of the Admiralty. It first reviewed the mode of working marine engines for some years past; and noticed the gradual change that had occurred,—particularly the tendency to use high pressure steam instead of that of a pressure of about four pounds above the atmosphere. It then examined the system of cutting off the steam at various parts of the stroke; and as at the same time a remarkable augmentation had occurred in the speed of the vessels, which was naturally attributed to that cause, it inquired into these several causes and effects, as well as into the reduction in the consumption of fuel which took place. In this examination, all the arguments for and against the use of high steam, and on the presumed gain or loss of mechanical power in the use of the expansion principle in the cylinder, were canvassed; and the paper wound up with the replies of the author to the three questions from the Admiralty, to this effect:—

"The highest pressure of steam that we have, in any case, put upon a marine boiler of our own construction, was about 16 lbs. to the square inch; but we are not inclined to repeat the experiment, as we feel assured that we can obtain equally good results with steam of a lower pressure. From 10 to 12 lbs. is the usual pressure we employ in the merchant service for engines and boilers of comparative small power. The steam pressure at present employed in the service is about 8 lbs. per square inch. We consider steam of this pressure to be well adapted for the exigencies of the service; we believe it is calculated to secure all the important advantages of power, economy of weight and space, in a very eminent degree; these advantages will, in some respects, be slightly increased by augmenting the steam pressure to 10 or 12 lbs. to the square inch. We strongly recommend that the steam employed in the navy should not be of greater pressure than 10 lbs. per square inch, or, in extreme cases, 12 lbs. to the square inch; any material increase to the latter pressure will be attended with considerable risk, without any adequate advantage."

In the discussion which ensued, these propositions were to a certain extent concurred in, but with limitations as to the introduction of other forms of boilers; and it was explained that the arguments were applicable only to condensing engines working expansively, and therefore left the question of the introduction of the use of high pressure non-condensing engines quite untouched and free for discussion at a future period. Ibid.

AMERICAN PATENTS.

List of American Patents which issued in the month of January, 1849, *with Exemplifications by* Charles M. Keller, *late Chief Examiner of Patents, in the U. S. Patent Office.*

1. For an *Improvement in Shower Baths;* Ephraim Larabee, Baltimore, Maryland, January 2.

Claim.—"What I claim, is the combination of a movable reservoir with a jet bath, constructed as described."

2. For an *Improvement in Manufacturing a Circular Plate, or Cutting a Circular Aperture in Sheet Metal;* Joseph F. Flanders, Newburyport, Massachusetts, January 2.

Claim.—"What I claim as my invention, is the combination, in one frame, of a set of cutting dies and one or more sets of beading or edging dies, so applied together, and to the frame, as to permit of the easy insertion of the plate at the commencement of the cut or any part of it, and so that the plate or sheet of metal may be operated upon simultaneously by both beading and cutting dies, when the frame is revolved on its spindle."

3. For an *Improvement in Forming Hubs of Carriage Wheels and Attaching them to Axles;* J. R. D. Munson, Williston, Chittenden county, Vermont, January 2.

Claim.—"What I claim as new, is the employment of the solid cap and circular nut, combined and arranged as described."

4. For an *Apparatus for Anti-Friction Boxes;* Thos. Hopper and Thos. Garrison, New Brunswick, Middlesex county, New Jersey, January 2.

The patentees say,—"The nature of our improvement consists in arranging around a journal suitable for the purpose intended, a series of wheels which we denominate blocks, that traverse around a stationary including cylinder, which is connected with the frame in any of the usual ways; the exterior surface of the journals and blocks, and also the interior surface of the cylindrical bearing, being grooved, so as to form what are generally called mitre teeth, the two faces of which are at right angles, or nearly so, with each other."

Claim.—"What we claim as new, is, 1st, supporting the box or journal upon the series of mitre-grooved rollers or blocks, working into similar grooves on the journal and bearing, said rollers being without journals."

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5. For an *Improvement in Draws for Railroad Viaducts;* Joseph Ross, Ipswich, Essex county, Massachusetts, January 2.

Claim,—"What I claim as my invention, is a draw constructed on two or more parallel turning frames or timbers."

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6. For an *Improvement in Corn and Seed Ploughs;* Abner Leland, Milton, Northumberland county, Pennsylvania, January 2.

The patentee says,—"The nature of my invention and improvement consists in shaping the shares so that they will serve the treble purpose of making furrows in which to plant seed, covering the seed, and pressing down the soil with which it is covered. Also, in arranging the tongue by which the horses draw, so that it can be made to project from the narrow or the wide end of the plough, at the option of the operator, by which means the narrow end of the plough can be carried forward, and the soil turned from the centre outward, so as to form a deep wide furrow or ditch, or the wide end can be placed in front, and the soil turned from the sides to the centre, so as to make a broad ridge. Likewise in attaching to the share a removable landside."

Claim,—"What I claim as my invention, is the construction of the removable landsides with wings, in combination with shares made without either bosses, loops, or other projections, upon the sides, that could interfere with their being turned bottom-side up, and attached to the shanks in that position, or obstruct their action when thus turned; the landsides and shares, so constructed, being connected together by one or more screw-bolts, or by other analogous means."

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7. For an *Improvement in Ploughs;* Jesse Layman, Lebanon, Warren county, Ohio, January 2.

The patentee says,—"The nature of my invention and improvement consists in constructing the share and the lower portion of the mould-board, and the landside, in one piece, the upper part of the mould-board being joined thereto by rivets, screw-bolts, or otherwise, and combining with the mould-board, share, and landside, thus constructed, a winged, double-edged coulter, which can be used either as a coulter, or as an auxiliary mould-board and share, as circumstances might render it advisable. By this means the plough is applicable to making deep furrows, as in summer fallowing, or to stirring up superficially a wide furrow, as in cultivating the soil between rows of corn. When deep furrows are made, the strain upon the point of the plough is greatest, and to give the plough the requisite strength for this operation, to resist the increased strain, the coulter is turned up and firmly screwed to the beam, which thoroughly braces it."

Claim.—"What I claim as my invention, is the combination of the adjustable hinged and winged coulter with the mould-board, landside, and beam. I also claim the combination of the auxiliary mould-board with the principal mould-board and adjustable coulter."

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8. For an *Improvement in a Turning Lathe for Wheels;* Arunah S. Macomber, Bennington, Bennington county, Vermont, January 2.

The patentee says,—"The nature and principle of my invention consists in placing the box to be turned or rimmed out, on a lathe within a revolving chuck, through which passes a fixed spindle with a cutter attached to it, and connecting the said chuck and stock head to a saddle, which, by a slot or slots therein, and pivots or centres connecting the said saddle to the slide, allows the saddle, poppet head, and chuck, to be set at any angle with the cutter on the spindle, whereby boxes of any required taper may be cut or rimmed out, as the chuck revolves around the cutter and moves with the slide."

Claim.—"What I claim as my invention, is the saddle, constructed with a slot or slots, combined with pivots or screws, or swivels, and with another slot or slots in the flanch below, whereby the said swivels will act as centres or swivels, for the saddle to be moved either transversely or set at any angle with the point of the cutter on the fixed spindle, so that when the box and chuck revolve round the cutter, and with the slide as it moves horizontally on the bed of the lathe, boxes for carriage and other wheels may be turned or rimmed out of any required interior taper."

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9. For an *Improvement in Manufacturing Lamp Black and Coldphane, and Calcining the Lamp Black;* Edward Clark, Brooklyn, Kings county, New York, January 2.

The patentee says,—"The nature of the first part of my invention consists in producing by one and the same operation lamp black and coldphane, by the distillation or decomposition of common rosin in heated iron retorts, and by the inflaming of a part of the products of the distillation to produce the lamp black, and thus leave the other constituent or portion of the substance to distill over in the form of coldphane. The second part of my invention, which relates to the apparatus in which I apply my improved process, consists in combining the chamber in which the lamp black is deposited, and the coldphane receiver, with the retort in which the rosin is decomposed, when the said retort is provided with a beak having burners for the burning of the inflammable gas evolved, to produce the lamp black, and a pipe through which the coldphane is conducted or delivered into the receiver. And the last part of my invention consists in combining with the burners on the beak of the retort in the lamp black chamber, a rotating hollow cylinder, into which lamp black can be placed to be calcined."

Claim.—"What I claim as my invention, is the manufacture or production of lamp black and coldphane by one and the same process of decomposing rosin. I also claim as my invention, in the apparatus for the manufacture or production of lamp black and coldphane, the combination of the lamp black chamber, and the coldphane receiver, with the retort provided with the burners for inflammation, and the pipe for the delivery of the coldphane. And finally, I claim the hollow cylinder for the calcination of lamp black, in combination with the burners in the lamp black chamber."

10. For an *Improvement in Screw Wrenches;* Frederick H. Bartholomew, City of New York, and Solomon Merrick, Springfield, Hampden county, Massachusetts, January 2.

Claim.—"What we claim as our improvement in this wrench, for the purpose of holding and turning cylindrical substances, is the combination of the lever with the main bar of the wrench, also with the slide, the nut, and the spring."

11. For an *Improvement in Making Wrought Iron Tubes;* James M'Carty, Reading, Berks county, Pennsylvania, January 9.

The patentee says,—"The nature of my invention consists in combining with the finishing rollers a mould or former for receiving the skelp from said rollers, and, by means of the form of said mould or former, gradually bending the skelp into a suitable form for welding into tubes."

Claim.—"What I claim as my invention, is the construction and arrangement of the mould, in combination with the finishing rollers of a common rolling mill."

12. For an *Improvement in Journals and Axles;* Charles Chinnock, City of New York, January 9.

Claim.—"What I claim as my invention, is the confining an axle or journal within a box by means of a spherical ball or balls running in a channel made partly in the journal and partly in the box."

13. For an *Improvement in Heading Rivets, Bolts, Spikes, and Nails;* Jonathan Beardsley, Trenton, Mercer county, New Jersey, January 9.

Claim.—"What I claim as my invention, is the combination of the carriage and punch holders with the roller or its mechanical equivalent, by means of which the spike is hook-headed by a single motion."

14. For an *Improvement in Producing Music;* Adoniram F. Hunt and Jas. A. Bradish, Warren, Trumbull county, Ohio, January 9.

Claim.—"What we claim as our invention, is the making and application of detached sheets, plates, or theorems, prepared by perforating, indenting, or otherwise adapting them to operate hammers, weights, keys, valves, levers, wires, or springs, to produce music or musical tones, using for the said sheets, plates, or theorems, any metal or material which will produce the intended effect. We also claim the right to hook or catch the ends of the said sheets, plates, or theorems together, so as to form an endless band if required, and the right to use gibs or cams, springs, movable frame, and rollers; the said rollers prepared by grooving, or otherwise adapting them to give motion to said sheets, plates, or theorems, for the purpose of producing music or musical tones, by operating hammers, weights, keys, valves, levers, wires, or springs."

15. For an *Improvement in the Improved Corn Plough;* William Richter, Williamsburg, Wayne county, Indiana, January 9.

The patentee says,—"In the use of this improvement the cultivator teeth go before and loosen up the ground, and the corn fender comes after, clears away all the trash and clods from the young corn, and the plough follows after, and lays the fine earth or soil up to the corn without disturbing it."

Claim.—"What I claim as my invention, is the corn fender, in combination with the cultivator teeth and the plough, acting as above."

16. For an *Improvement in Making Shears;* Benjamin W. Warner, City of New York, January 9.

The patentee says,—"The nature of my invention consists in attaching the lower blade of the shear to a bar, and making it work in combination with the upper blade by means of a short arm or lever worked by the upper hand lever, by which arrangement the blades are made to act, in cutting, more nearly parallel to each other than those of the ordinary shears, thus increasing the facility of their use, by lessening the spread of their points, and keeping the lower part of the shears constantly in contact with the surface upon which the material is laid to be cut, at the same time that the power of the hand is applied more equally on the whole blade than in any other plan hitherto in use."

Claim.—"What I claim as my invention, is the construction of the lower blade separate from the upper lever and jointed to it."

17. For an *Improvement in Gathering and Securing Vines for Forage;* John B. Stanley, Copiah county, Mississippi, January 9.

Claim.—"What I claim as my invention, is the mode of securing vines in a green state, by putting them up in hollow rolls, and also the apparatus for gathering vines and forming such rolls."

18. For an *Improvement in Making Hats;* Adrian Bancker and Charles F. Alvord, City of New York, January 9.

The patentees say,—"Our invention, discovery, or improvement, consists in substituting for the ingredients usually employed, a solution of gutta percha, prepared in any usual manner, for the purpose of stiffening the body of the hat."

Claim.—"What we claim as our invention, is the application of a solution of gutta percha, for the purpose of stiffening hat bodies, and uniting the plush or other cover to the body, as a substitute for shellac, glue size, and seed lac, or other articles hitherto used for such purposes."

19. For an *Improvement in Extracting Teeth;* Enoch Osgood, Bangor, Penobscot county, Maine, January 9.

The patentee says,—"The nature of my invention consists in so adjusting an instrument as to insure certainty in the operation of extracting teeth, and of preventing pain, by protecting the surrounding parts from injury."

Claim.—"What I claim as my invention, is a compound fulcrum, partly concave and partly convex, of which the former rests upon the surrounding teeth, and the latter upon the tooth to be extracted."

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20. For an *Improvement in Coating Telegraph Wires;* Benjamin H. Green, Princeton, Mercer county, New Jersey, January 9.

Claim.—"What I claim as my invention, is the construction of an apparatus for aiding in the painting or coating of telegraph wires, (or for other purposes,) by the combination of rotating and stationary brushes, and suspension pulleys or their equivalents, with a portable receptacle for paint or other coating matter, not intending by this claim to limit myself to the particular form, number, and arrangement, of the parts composing the apparatus, for aiding in the painting or coating telegraph wires, but to vary the same as I may deem expedient, whilst I attain the same end by means substantially the same."

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21. For an *Improvement in Making Cores and Moulds for Casting Metallic Pipes and Tubes;* Chapman Warner, Louisville, Jefferson county, Kentucky, January 9.

Claim.—"What I claim as my invention, is, 1st, the improvement in the core tube, caused by screwing it by a longitudinal slit, to allow of compression as the metal contracts in cooling.

"2d, I claim the manner of compressing a coating of sand upon my improved core tube, or upon any core tube or rod, (or the formation of solid sand cores,) by means of sections operating by machinery, one of said sections being stationary, towards which another section is forced in a direction perpendicular to its plane, and the two other sections being forced towards each other, between the two first described.

"3d, In combination with the above mentioned core-box sections, or any other analogous core-forming sections, I claim the (slightly elastic) core-tube, bearing plates and caps, or their equivalents.

"4th, I claim the manner of compressing the sand into a half flask, and giving it the impression of the patterns, by placing the pattern at the base of a forming box and covering it with sand, and then placing the half-flask upon the sand covering the pattern, and forcing it down upon the same.

"5th, I also claim the manner of preserving the cores in a central position within the moulds, by means of concavo-convex skeleton or open stays, formed of thin narrow sheets of metal, and combined with a core and mould."

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22. For an *Improvement in Drawing Frames for Drawing Cotton;* Charles Danforth, Paterson, Passaic county, New Jersey, January 9.

The patentee says,—"My first improvement relates to the mode of stopping the machine whenever any one of the rovings gives out, that another may be supplied, and thus keep all the parts of the drawing frame equally in action, that each may receive an equal quantity of rovings; and my invention consists in making use of the weight of the rovings, to act on a balance lever guide, which, when liberated by the giving out of any one roving, will fly up and bring an arm in contact with a fly connected with a sliding clutch, that shifts the belt on to the loose pulley, and thereby stops the whole drawing frame until a new roving can be supplied or the old one spliced. And the second part of my invention relates to the employment of a regulated stop-motion, connected with the belt guide, which, at a given time, (determined by the size of the cams and the number of the roving or roping,) will stop the drawing frame, to prevent too great a quantity of roving or sliver from being coiled or packed in the cams. And this part of my invention consists in the use of a flying trigger or cam, on a rotating shaft receiving motion from the main or any other shaft, which, at the end of the operation of the machine, is gradually forced back, and, when liberated, forces out a catch lever that holds the weight or spring lever by which the belt guide is shifted, and at the same time flies beyond the end of the catch lever, that the belt guide may be immediately shifted back to start the machine at once, without waiting for the spur or trigger to have rotated sufficiently far to clear the catch lever, as would be the case, from the necessarily slow motion of the shaft, if the spur was permanently attached to this shaft."

Claim.—"What I claim as my invention, is the method of stopping the operation of drawing frames or drawing heads, by means of guides, each of which is attached to an end of a horizontal balance lever, so that they shall be kept down (to permit the drawing head to operate) by the weight of the roving, and fly up to stop the machine the moment they are relieved of the weight of the rovings. I also claim the employment of a flying trigger, in combination with the apparatus for shifting the belt, or any other substantially the same, whereby the trigger flies past the end of the catch lever, to permit the mechanism that shifts the belt to be re-set without delay."

23. For an *Improvement in Filing and Setting the Teeth of Saws;* Presbury Norton and Franklin D. Cottle, Tisbury, Dukes county, Massachusetts, January 9.

Claim.—"What we claim as our invention, is, 1st, the combination and arrangement of the operating file handle, the adjustable standards rising from the turn-table, the adjustable bearing plates, (secured to the standards,) the elastic arm, point, and curved gauge-plate, with each other, and with the saw clamp."

24. For an *Improvement in Planting Seed;* B. F. Partridge, Syracuse, Onondaga county, New York, January 9.

Claim.—"What I claim as my invention, is the combination of the index on the axle, and the numbers or marks on the cover of the grain box, with the apertures in the planting plate."

25. For an *Improvement in Wrought Iron Pipes;* Joseph M'Culley, Philadelphia, Pennsylvania, January 9.

The patentee says,—"The nature of my improvement consists in the construction and application of the tongues or dies, through which a flat skelp, after it has been heated, is drawn, to turn it into proper form to be welded into tubing."

Claim.—"What I claim as my invention, are the dies or tongs, formed substantially as herein described, for forming skelps into the proper curve for welding, in the manner set forth."

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26. For a *Machine for Cutting away Bogs;* John D. Filkins, Lima, La Grange county, Indiana, January 9.

The patentee says,—"The nature of my invention consists in so arranging, in a proper frame work, a set of horizontal steel knives, which are drawn along the surface of the ground, and cut or shove off what are termed bogs from marshy places, thus leaving a clean surface; and also in attaching the middle beam of the aforesaid frame to the rear end of a sled, the front or inclined part of the runners being provided with steel knives, so that, as the machine is drawn along by the team, when the runners come in contact with a bog, the knives will split it and yet keep the machine level and steady."

Claim.—"What I claim as my invention, is, 1st, providing the front or inclined part of the runners of the sled with steel knives, for the purpose above mentioned.

"2d, I claim the combination of the sled with the frame work to which the horizontal knives are attached. And lastly, I claim the combination of the double horizontal knives, resting on the surface of the ground and inclining backwards at an angle of about 45° with the pole."

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27. For an *Improvement in Railroad Car Wheels;* Linus Dean and Abram Higham, Utica, Oneida county, New York, January 9.

The patentee says,—"The improvement is in the form and construction of the spokes of the wheel, to which is given a complex curved form, both for the strength of the wheel, and to allow a slight contraction in the process of cooling, when cast, without breaking the spoke or other part of the wheel, although the hub is cast whole."

Claim.—"What we claim as our invention, is the peculiar construction of the spoke of the wheel here described, the same being formed of a folded plate, doubling to nearly parallel lines at the hub and expanding towards the rim, uniting to it in nearly a semi-circular form, thus covering and sustaining the rim, while the complex curvature of the spoke (the same being curved in a vertical as well as a lateral direction) allows an expansion and contraction of the metal favorable to the durability of the wheel, and permits it to be cast solid with an entire hub, without cracking."

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28. For an *Improvement in the Plough and Cultivator;* Herman B. Sinclair, Lyndenville, Orleans county, New York, January 9.

Claim.—"What I claim as my invention, is the method of regulating the draught by a standard, bolt, and regulating set."

29. For an *Improvement in Railroad Car Wheels;* William B. Treadwell, Albany, New York, January 9.

The patentee says,—"My said invention and improvement consists in forming the connexion between the nave or hub and the chilled rim of a cast iron car wheel, all cast in one piece, in such a manner as to dispose of or arrange the metal between the hub and the rim in the strongest mechanical forms, and, as nearly as practicable, in the line or lines of the force to which the wheel is to be subjected in use on railroads, at the same time making sufficient provision for the contraction of the iron in cooling, when the wheel is cast, without danger of fracture or any unnecessary strain upon the parts, in which respect my wheel is preferable to the double and single plate car wheel heretofore in use, and also in avoiding or diminishing the liability of such plate wheels to have the granular texture of the iron composing their plates disintegrated and broken by the swinging and vibratory motion to which they are exposed in use, and also in wholly obviating the danger of cracking around the circumference of the chilled rim between the plates, to which such double plate wheels are liable."

Claim.—"What I claim as my invention, is the combination of the arch piece and the hollow annulus, and the solid annular parts by which the solid hub is connected with the rim and flanch."

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30. For an *Improvement in Making Cast Iron Car Wheels;* James M. Cook, Taunton, Bristol county, Massachusetts, January 9.

The patentee says,—"The nature of my invention consists in the method or form of constructing wheels for railroad cars, or other purposes, in such a manner as to combine the spoke wheel, the single plate wheel, and the double plate wheel, so that the wheel may be of light weight and possess the necessary strength."

Claim.—"What I claim as my invention, is the constructing of wheels for railroads or other purposes with spokes, single plate and double plate combined."

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31. For an *Improved Body Supporter;* Henry Mellish, Walpole, Cheshire county, New Hampshire, January 9.

Claim.—"What I claim as my invention and improvement, is the employment of combined serpentine and straight slotted springs with the shoulder straps and back pads; said elastic serpentine springs being formed so as to admit of a more easy, lateral, and twisting motion of the body of the wearer, than can be obtained by the use of the flat dorsal spring as now used, said serpentine springs having likewise a constant tendency to extend themselves longitudinally, which causes them to have a continual upward bearing against the shoulder braces, which relieves the spine of a portion of the weight of the upper part of the body by a constant lifting motion. I likewise claim the manner of constructing the back pads, each with a revolving ring to which the illium spring is attached, and circular notched groove in which the pinion and axle (attached to the ring and illium spring) play round freely during the operation of adjusting the abdominal pad, the teeth of the pinion being constantly engaged with the teeth of the circular groove, the use of said circular groove allowing the abdominal pad to be changed to a variety of positions, horizontally, vertically, or obliquely. I also claim the manner of constructing the abdominal pad: that is to say, with a hollow revolving plate for the purpose of taking in the spring, and letting it out by a turning plate, and thus graduating its length and pressure upon the inner plate of the abdominal pad, thereby fitting the pad to different protuberances of the abdomen."

32. For an *Improvement in Railroad Chill Wheels;* Edward B. Baker, St. Philip's and St. Michael's parishes, Charleston district, South Carolina, January 9.

The patentee says,—"The nature of my invention consists in providing a single plate to connect the hub and rim, the said plate being convex on the inner side, and concave on the outer, with arms curving from the hub to the rim, and reversed to the right on one side of the plate and to the left on the other, thus adding strength and durability to the reverse arm concavo-convex single plate chill wheel."

Claim.—"What I claim as my invention, is the single plate which connects the hub and rim, with curved arms thereon, reversed to the right on one side of the plate and to the left on the other, and likewise my mode of tempering the said wheels, by which all injury to the chill of the wheel is avoided."

33. For an *Improved Knitting Needle;* James Hibbert, Providence, Rhode Island, January 9.

The patentee says,—"My invention consists in the application of a latch or tongue, in connexion with the hook of the needle, sweeping freely back and forth upon the centre pin."

Claim.—"What I claim as my invention, is the application of a latch or tongue to the hook of the needle."

34. For an *Improvement in Cast Iron Wheels for Railroad Cars and Engines;* Albert T. Converse and Wm. L. Cooley, Norwich, New London county, Connecticut, January 9.

The patentees say,—"Our improvement consists in making a wheel with solid hub, having two sets of arms placed in such position that their outsides are nearly parallel with, and form part of, the sides of the wheel."

Claim.—"What we claim, is the mode of connecting the arms of one side with those of the other side."

35. For an *Improvement in Blacksmiths' Forges;* Ephraim Harris, Springfield, Hampden county, Massachusetts, January 9.

The patentee says,—"The nature of my invention and improvement consists in the employment of a perforated ball, in combination with a convex-socketed hearth plate and flanched air chamber, for regulating the fires of blacksmiths' forges, by increasing or diminishing the quantity of air admitted to the fire by simply turning the ball in its socket, which is effected by means of a handle applied to a rotary shaft, projected horizontally from the convex surface of the ball and forming part of it, a suitable box or bearing being attached to the hearth plate or top of the air chamber in which the shaft turns."

Claim.—"What I claim as my invention, is the employment of a revolving perforated spheroid, oblate at one of its poles, as a rotary central bottom for blacksmiths' forges, in combination with the convex hearth and attached air chamber, performing the combined office of a fire regulator and coal agitator."

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36. For an *Improved Lubricator for Joints of Machinery, &c.;* P. S. Devlan, Reading, Berks county, Pennsylvania, January 16.

The patentee says,—"This lubricator consists in the mixture of caoutchouc with spirits of turpentine, or other solvent of that gum, carbonate of soda, glue, common animal or vegetable oil, or other cheap fatty matter, and water."

Claim.—"What I claim as my invention, is the combination of ingredients here described, or of others possessing similar properties, and forming an analogous compound, whether the proportions be the same as herein set forth, or varied to any extent that the same may admit of, without changing the peculiar character of the compound as a lubricator."

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37. For an *Improved Machine for Excavating or Dredging and Removing Obstructions to Navigation in Rivers, Harbors, &c.;* James Callaghan, New Bedford, Bristol county, Massachusetts, January 16.

The patentee says,—"The nature of my invention consists, 1st, in providing suspension movable braces or levers, united by an angle, on which are fixed two grooved shears or pulleys, over which revolving scooping buckets pass on two endless chains; and, in conjunction with the said suspension braces, I provide a vertical sliding frame, attached to the bow of the dredge-boat as the case may be, and to have grooved shears or pulleys on said sliding frame, over which the scooping buckets also pass on the duplicate endless chains, for the purpose of scooping or excavating at any angle, and at any desired depth, by having the suspension braces fixed on the side of the dredge-boat, and kept in such a relative position with the sliding frame as will keep the scooping buckets moving in a horizontal line, or scooping at any angle. 2d, I provide scooping buckets with bottoms capable of being thrown open by a cam fixed on the vertical sliding frame, so that the mud, &c., may be discharged from the buckets at that part of the frame on which the cam is fixed. 3d, I also provide a capstan drum, to surround an upright power shaft, loose on the same, but made to gear with it by a clutch. Around this drum are wound chains, which are attached to the suspension levers, and also to the vertical sliding frame, so that when the levers or frame mentioned are to be elevated or lowered, the said capstan drum is clutched with the power shaft, and the chain or chains wound up or let off, and the levers or frame elevated or lowered, to change the line of draught of the scooping buckets. 4th, I provide scows or tenders, into which the mud, &c., is to be discharged, and provide said tenders with discharge ports of such depths as will allow said scows and tenders to discharge their mud, &c., in any depth of water, and especially in shallow water or streams, where the tender may get aground, so that the mud may be discharged without waiting for the tide to lift the tender, as is the case with all mud tenders at present in use."

Claim.—"What I claim as my invention, is the vertical sliding frame, to regulate the scooping line of draught, in combination with the suspension levers, whereby the buckets, as they revolve over the pulleys, are made to scoop at any angle at any depth."

38. For an *Improvement in Cast Iron Car Wheels;* Samuel Truscott, Columbia, Lancaster county, Pennsylvania, January 16.

The patentee says,—"The nature of my invention and improvement consists in forming the wheels with a combination of curved spokes and arms, of such form and character as to produce a continuous and uninterrupted tie and bracing of all the said curved arms or spokes with themselves, and with the rim and hub, by which intermediate, or auxiliary, or zig-zag rims are formed in the annular space between the hub and the outer rim, and by which the number of the bearing points on the said outer rim is made double those on the hub, making a much stronger and more beautiful wheel than has yet been produced, and which will not be liable to crack in cooling when cast in chills, as is now generally practised."

Claim.—"What I claim as my invention, is tieing and bracing the arms of the wheel together in the annular space between the rim and the hub, forming intermediate, or auxiliary, or zig-zag rims in said annular space, and double the number of bearing points on the rim that there are on the hub."

39. For an *Improved Boot Crimp;* Henry Wright, Newcastle, Lincoln county, Maine, January 16.

The patentee says,—"The nature of my invention and improvement consists in providing the back of the boot form with a sliding lever, which extends from the top or upper part of the form downward to the heel of the same, and thence under the foot of said form, to a point at or near the toe thereof; which sliding lever is so constructed that, by turning a thumb screw at the top of the leg of the form, and on the back thereof, this sliding lever leaves the back of the form, opening therefrom, backwards and downwards, with great mechanical force and tension."

Claim.—"What I claim as my invention and improvement, is the method of crimping boot fronts, by means of a sliding lever affixed to an ordinary boot form, on the back and bottom thereof, extending from the top of the form around the heel with a joint, and thence under the foot of the form towards the toe thereof. I claim the combination of the jointed sliding lever, inclined planes, slides, hinge, tie, stop, and the screw as applied thereto."

40. For an *Improvement in Cocks for drawing off and stopping water and other fluids at high temperatures;* John Sheriff, Pittsburg, Allegheny county, Pennsylvania, January 16.

Claim.—"What I claim as my invention, is the wooden stopper, in combination with an expanded recess for its reception, and with a stem entirely unconnected with it, there being a washer between them, so that the stopper may be pressed down upon its seat by the stem without turning."

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41. For an *Improved Machine for Sawing Clapboards;* Bliss Coiser, Mount Morris, Livingston county, New York, January 16.

The patentee says,—"The nature of my invention, consists in so constructing the carriage and combining it with other parts of the machine, that when the thick plank, or piece of timber of suitable thickness, is placed upon the carriage, and the machine put in motion, it will automatically operate as follows: The portion of the carriage upon which the timber rests will have its side most distant from the saw alternately elevated and depressed, so as to incline the front edge of the timber, in combination with the feed movement, in such a manner that the saw will cut from the timber, at each forward movement of the carriage, clapboards, double the thickness at one edge that they are at the other, their thick and thin edges regularly alternating from the top to the bottom of the piece of timber."

Claim.—"What I claim as new, is the combination of the several parts of my machine, in such manner that it will automatically saw clapboards of the shape herein described, viz., the vibrating frame or adjustable portion of the carriage hinged to the lower portion, the head block, the racks (projecting from the head block), the shaft H, with the pinions *i*, mashing into racks I I; the shaft F, geared to H; the ratchet wheel *b*, and the vibrating lever *d*, connected to shaft F; the pawls on the upper end of *d*, playing into the ratchet wheel *b*; the studs projecting from the rear end of the machine; the leg or supporter descending from the adjustable portion of the carriage; the inclined planes rising from the front end of the vibrating lever L; the tooth projecting from the inner side of L; the ratchet wheel K, secured to the side of the machine; the palls descending from the carriage; the axle *p*, with the tooth *r*, and the balance lever V; the vibrating levers X and Y; the axle m'; the toothed wheel Z, and pinion b' on m'; the pinion a' on the shaft J; the pinion *u* on the shaft W, mashing into the rack *z*, on the under side of the carriage; the elastic notched rod e', rising from the front end of lever Y; the retaining pin h', projecting from the side of the machine; the weight g', suspended to the front end of lever Y; the elastic notched rod f', rising from the rear end of lever X; the retaining pin h'', projecting from the side of the machine; the weight g'', suspended to the rear end of lever X, and the block t', projecting from the under side of the carriage; the above enumerated parts or their equivalents, I claim the arrangement and operation of, substantially as herein set forth.

"I also claim the particular combination of the inclined planes rising from the front end of the vibrating lever L; the tooth projecting from the inner side thereof; the ratchet wheel K; the leg or supporter, descending from the adjustable portion of the carriage; the axle *p*, with its retaining tooth and balance lever; the pawls descending from the carriage, and the projection from its side, arranged and operating as set forth, for the purpose of producing a regular alternating up and down movement of the outer edge of the adjustable or vibrating portion of the carriage.

"I also claim, in combination with the respective parts for vibrating the upper portion of the carriage, the studs, the vibrating lever, the pawls, the ratchet wheel, the shafts, and the racks connected to the head block, for the purpose of imparting the proper feed motion to the timber placed upon the vibrating portion of the carriage.

"I also claim the combination of the toothed wheel, having internal teeth, and the pinion b', on the same axle, with the pinion a', on the vibrating end of the shaft J, and the weighted levers and spring catches, for the purpose of communicating a slow forward movement to the carriage, and a rapid backward movement thereto."

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42. For an *Improvement in Harvesting Machines;* Oliver Barr, Aurora, Kane county, Illinois, January 16.

Claim.—"What I claim as my invention, is, 1st, the form of the fixed sickles with the curved edges, in combination with the triangular sickles attached to the vibrating bar, and operated as specified.

"2d, I claim the combination and arrangement of the guide rail with the reel heads, the chain bands, the revolving rake, and the inclined platform, formed and applied as set forth.

"3d, I also claim the combination of the trap-doors, or folding platform, for the purpose of forming and dropping the grain in bundles, with the camb-blocks, inclined wedge, levers and cord, or other similar devices, arranged and operated in substantially the same manner for attaining the same object."

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43. For an *Improvement in Looms;* A. Bigelow and J. Butler, Granville, Licking county, Ohio, January 16.

Claim.—"What we claim as our invention, is, 1st, the combination of the picker valve, alternator, and slide spring.

"2d, We claim the combination of the picker table, picker arm, picker staff, picker roller, and roller 15.

"3d, We also claim the combination of the marcher, oblique slide, marcher slide, marcher catch, levers 38, catch springs, and heddle guides."

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44. For an *Improvement in Machinery for Post-Marking Letters, &c.;* Emory N. Moore, Boston, Massachusetts, January 16.

The patentee says,—"The peculiar object of my machine is to imprint on letters or parcels, or other mailable matter usually deposited in post offices, for the purpose of being transported or sent in the mails, the usual post marks, such as the name of the place, date of reception of the letter, and price to be paid for transmitting it, together with the word "paid," or any other word, letter or letters, figure or figures, device or devices, that it may be deemed advisable to stamp thereon. All this has been effected by stamps used in the hand of some officer of the post office, and, where much business is done in an office, this duty consumes much valuable time, and in consequence thereof, creates a consequent expense. By the use of my machine, many thousand letters may be stamped in a very short period of time, in comparison to what would be consumed were the usual process of accomplishing the same resorted to."

Claim.—"What I claim in my invention for post-marking letters, is the spring grips, as applied in combination with the cylinders and letter conveyor, and to each printing block and bed.

"2d, I claim spring stops and apparatus for working them, as applied in connexion with each endless belt or apron and the spring grips.

"And lastly, I claim to make the beds or printing surfaces or blocks so as to be capable of receding and adapting themselves to letters or parcels of various thicknesses."

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45. For an *Improvement in Cultivators;* David B. Rogers, Seneca Falls, Seneca county, New York, January 16.

The patentee says,—"The nature of my invention consists in a combination of known mechanical devices and principles of machinery, whereby the frame of the wheeled cultivator, containing the cultivator teeth, can be readily raised above, and carried over, stones and other obstructions in its path, and then immediately lowered again, so as to cause the teeth to plough the required depth of furrows, and by which the cultivator is firmly adjusted to plough the ground at a uniform depth, or to carry the teeth entirely above the surface in turning in the end of the land, and in other situations when it is required that the teeth should not touch the ground."

Claim.—"What I claim as my invention, is, 1st, the mode of raising and lowering the frame containing the cultivator teeth, for the purpose of gauging the machine for deep or shallow ploughing, or for moving it from place to place, without causing the teeth to touch the surface of the earth, by means of the combination and arrangement of the crank axletree, cogged wheel, cogged segment, short axle, lever, and perforated holding plate, in combination with the frame of cultivator teeth and sustaining wheels.

"I also claim the combination and arrangement of the binding and sustaining plates with the transverse beams to which said plates are secured."

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46. For an *Improvement in Machinery for Making Boxes;* Wilbur M. Davis, Gardiner, Kennebec county, Maine, January 16.

The patentee says,—"The nature of my invention consists in turning out from a solid piece of wood a circular wooden box, turning or cutting a tenon on the same at the same time, and then, by a reverse motion of the same shaft or frame holding the cutters, a cover or lid is turned or cut, chamfering the inner edge at the same time to fit said box."

Claim.—"I do not claim any particular part of the machine as new, but what I claim as my invention, is the combination of well-known principles to effect an object which has not been effected before, which is to turn a box and cover by one operation.

"I also claim the arrangement of the sweep, in combination with the gauge rods, for varying the length of box and cover, in combination with the ratchet wheels, and the curved and notched rods. I finally claim the whole as a combination of the machine for effecting the object."

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47. For an *Improvement in Mill Bushes;* Hazard Knowles, Washington City, D. C., January 16.

The patentee says,—"The purpose of my invention is to furnish a bearing for upright shafts, which shall, at all times, keep the joint lubricated, prevent access of dust, and insure constantly the proper contact between the bearing and the neck of the shaft which runs in it; as well as allow for such slight deviations from the perpendicular position of the shaft or spindle as are found unavoidable in practice. The bush must also admit the spindle to be raised or lowered to a certain extent, to allow for a coarser or finer grinding, and for the gradual wearing away of the stones."

Claim.—"What I claim as new, is the constructing and arranging the bush for a vertical spindle or shaft, in such a manner that it will adjust itself to the bearing surface of the spindle or shaft as it or the bush wears away by friction, by making the bearing surface of the spindle or shaft, and the aperture in the bush for its reception, of a corresponding conical form, and so fitting the bush into a supporting frame that it may have free vertical play therein, and be kept in a proper position for bearing upon the spindle or shaft with the requisite force, by means of levers and weights, or their equivalents, substantially as herein set forth.

"I also claim, in combination with a conical self-adjusting bush for vertical shafts or spindles, the oil cup, having inclined revolving lubricators, whereby the necessary quantity of lubricating material is supplied to the bearing.

"I also claim, in combination with a bush frame or cylindrical enclosing support, the use of bushes or bearings for vertical shafts or spindles, with slightly-spherical exterior zones, to traverse the interior of the vertical frame, whereby trifling deviations from a perpendicular position in the spindle may take place without danger of deranging the supporting frame, or the closing plate of the bush that secures the oil from dust, in the manner herein set forth."

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48. For an *Improvement in Indicating Telegraphs;* L. G. Curtis, Cincinnati, Hamilton county, Ohio, January 16.

The patentee says,—"The basis of the 'American Indicating Telegraph,' invented by me, is upon these principles, viz., electro-magnetism, machinery, figures and signs, and their combinations, all combined so as to produce rapid indications between distant points. This end is obtained by means of a revolving disk or dial plate, marked with successive series of numerals, 0 1 2 3 4, arranged in a circle or otherwise, said dial plate being revolved by degrees as the galvanic current is completed and broken by the alternate vibration of the lever to which the pallets, armature, and springs are attached."

Claim.—"What I claim as my invention and improvement, is, 1st, the mode of conveying intelligence at distances, by means of a revolving toothed dial plate marked with the several successive repetitions of the series of numerals, 0 1 2 3 4, arranged in a circle on the face of the same, for representing the letters of the alphabet, said dial plate being turned by degrees, as required, by the combination of the escapement, cord and weight, the pallets, lever, and spring, the armature and lever being actuated by the electro-magnet, by breaking and forming the circuit.

"2d, I also claim the peculiar construction and invention of the escapement for actuating the dial plate, consisting of the combination of the pallet bar, the pallets, the triangular teeth; the whole work being confined to the inside, instead of being on the periphery of the wheels, as pallets and teeth of escapements heretofore have been constructed.

"3d, I also claim as my invention, the system of signs, consisting of the combination of the numerals 0 1 2 3 4, for indicating all the letters of the alphabet, and words and sentences, by the use of which, the necessity of having the whole or any part of the alphabet on the revolving disk, and of turning it a revolution, or nearly so, in order to indicate a particular letter, is dispensed with, it being only necessary to turn the dial plate a segment or so of a circle at each combination of figures to indicate a letter, which is done instantly by simply forming and breaking the circuit; and having thus formed the letters, it is evident that words can be spelled with great rapidity."

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49. For an *Improvement in Cast Iron Plate Car Wheels;* H. Felton, P. D. Cummings, and H. Hinckley, Portland, Cumberland county, Maine, January 23.

The patentees say,—"The principle of our invention is to preserve great strength and compactness in a plate wheel while allowing for shrinkage of the chilled rim. Aware that strength is sacrificed when plates, either plain or convex, are cast connecting the rim with a hub solid throughout, and that a due degree of compactness is wanting when plates unite only the parts of a divided hub, we have taken care to avoid both of these evils, by the manner in which we form our hub. This we form in three portions, tied together by four cross-stays, of which two are in a direction from the axle at right angles to that of the other two. The part of the hub comprised between the two side plates is enlarged to about one-third of the diameter of the wheel, more or less, into three flat circular rings, the middle one of which is connected to that on one side of it by one pair of the cross-stays above described, and with the ring on the opposite side by stays which run at right angles to the directions of the other pair, though lying in different planes."

Claim.—"What we claim as our invention, is the arrangement of cross ties and stays in the interior part of the hub of a plate car wheel, in combination with the expansion disks or rings, whereby those ties which unite two contiguous plates or disks shall alternate with those ties which connect one of said two disks to a third, by which means the elasticity both of the disks and stays is made available to meet the shrinkage of the wheel."

50. For an *Improvement in Rails and Wheels for Turning Curves on Railroads;* J. F. B. Flagg, Philadelphia, Pennsylvania, January 23.

The patentee says,—"The object of my invention is to obviate the friction which at present occurs between the rails and wheels at the curves of railroads. The nature of my invention consists in so forming both the rails and wheels for railroads, that the same freedom of motion is permitted on curves as on the straight parts of the track, when a pair of wheels is placed as usual on the same axle, and both made fast thereto. It also permits the accurate guiding, by the flanches, of the horizontal lateral movement of the wheels, doing away with the swaying surging motion from side to side.

Claim.—"What I claim as new, is the giving to the inner rails on railroad curves a greater breadth than is necessary for the bearing of the wheels thereon, and so sloping the sides inwards towards the middle of the track as to prevent any contact between the slope and the tread of the wheel, while it still serves to guide the flanch of the same, and thus to allow the coning part only of the wheel to travel on the inner rail of the curve. I also claim, in combination with the widened and beveled inner rails of railroad curves, the use of wheels having treads divided into two portions, the one cylindrical, or nearly so, and the other coning."

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51. For an *Improvement in Cylinders for Carrying and Supporting Cards, &c.;* Stephen R. Parkhurst, West Bloomfield, Essex county, New Jersey, January 23.

Claim.—"What I claim as new and of my own invention, is that constructive arrangement and conjoint application and action of the parts employed, by which metal plates, surrounded by a wire helix and solder, are united to form cylinders of more than usual strength, in proportion to weight, and the application of such cylinders to any mechanical purposes for which they are or may be available."

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52. For an *Improvement in the Manufacture of Cylinders for Burring Wool, &c.;* Francis A. Calvert, Lowell, Middlesex county, Massachusetts, January 23.

The patentee says,—"The object of my improvement is to produce the cylinders at a much less cost to the manufacturer, while at the same time they are as durable, perfect, and effectual in the production of the desired results, as those now in use; my new method of construction superseding the use of disks of wood, &c., and of any packing between the toothed plates."

Claim.—"What I claim as new, is a cylinder for burring, opening, picking, carding, and performing all other similar operations, on cotton, wool, &c., formed or produced by winding tooth wire, having flanches and teeth, upon the periphery of a metallic cylinder, either in a spiral or straight direction, whether the said wire be fastened thereon in spiral grooves, and properly staked, or by soldering or otherwise."

53. For an *Improvement in Shingle and Stave Dressing Machines;* Elisha Luter, Turnersville, Robertson county, Tennessee, January 23.

Claim.—"What I claim as my invention, is, 1st, the construction and application of the quadrangular wheel with its appurtenances, viz., the rollers and hands; to the uses and purposes above described.

"2d, I also claim the invention of the sliding or vibrating table, and its application, with its appurtenances, to the uses ascribed to them above.

"3d, I too claim the application of the inclined planes to the purpose described above; and

"Finally, I claim the construction and arrangement of the whole machine, taken in combination and applied to the purposes ascribed to them above."

54. For an *Improvement in Chucks for Lathes;* William Grant, Boston, Massachusetts, January 23.

The patentee says,—"One of the peculiarities of my chuck is that, without being made proportionably more ponderous than the rest of the lathe, it will be quite as strong and as free from liability to be broken. Its face plate can be slotted like the ordinary chuck-plate, and irregular bodies, whose centre of gravity is eccentric to its centre, can be chucked thereon with the utmost security, by stirrups and T-headed screw bolts, and heavy bodies of any description, when centred by the jaws, may be secured by stirrups and bolts in the ordinary way, to take off the strain from the jaws."

Claim.—"What I claim as new, is the combination of the connecting rods and jaws, jointed together and moving simultaneously, by means of a screw or otherwise, with the chuck-plate; whether the several parts be made and arranged as herein set forth, or in any other substantially similar manner, by which the jaws are moved towards or from the centre of the plate at the same time and at equal speed."

55. For an *Improvement in Shower Baths;* James Cortlan, Baltimore, Maryland, January 23.

The patentee says,—"The purposes which I have in view in the invention of this bath are, 1st, by means of suitable elevating apparatus, to enable the bather to raise at once as large a quantity of water as he may desire to use, and thereby to prolong his bathing at pleasure without stopping to replenish the cistern. 2d, By making the whole system of tubes and jets rise and fall with the water receptacle, to adapt the bath to bathe persons of different heights, or to bathe different parts of the same person without extending to the whole body. 3d, By means of separate valves, constantly under the control of the bather, the shower jets or douche may be taken either with full and strong currents, or gently and intermitting, at his option. 4th, By lowering the whole interior apparatus, and letting water flow gently through the lower jet pipes only, the lower extremities only may be bathed. This advantage adapts it to persons who dislike the wetting of the hair."

Claim.—"I do not claim as my invention the combination of lateral jets with a rising and falling cistern, but what I do claim is the combination of the showering pan, a divided cistern, and horizontal arms, whereby the head may be showered with water of one temperature, and the lower parts of the body with water of another temperature, during the same operation. I also claim, in combination, the douche bath, the divided cistern, and tubes with horizontal jet arms, as herein set forth, to give a douche to the head and a shower to other parts of the body, of a different temperture. I also claim making the showering pan capable of being separated from the cistern, and of thereby making way, when required, for the use of the central douche tube. I also claim the adjustable sliding section tubes, having horizontal movable arms, with jets capable of being brought nearer to, or more remote from, each other, for the purpose of concentrating more or less the shower thrown on the lower parts of the body."

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56. For an *Improved Roller Ox-shoe Machine with Movable Dies;* Philip P. Read, Bowdoin, Lincoln county, Maine, January 23.

Claim.—"I make no claim to the frame, roller, axles, and gearing, as these are made and arranged like the ordinary rolling mill, nor do I claim segment dies fastened on rollers by screws; but what I do claim as my invention, is the employment of the segment and triangular dies, constructed, arranged, and operated as described, in combination with the cylinder made with beveled collars and nut for securing them."

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57. For an *Improvement in Seed Planters;* Ebenezer J. Dickey, Hopewell Cotton Works, Chester county, Pennsylvania, January 23.

The patentee says,—"The nature of my invention consists in constructing a corn drill or seed planter in such a manner that but a single kernel will be deposited at a time in the drill."

Claim.—"What I claim as new, is the combination and arrangement of the grain box, the cup, the rotating perforated plate, the elastic brush, and the recesses in the lower edge of the rear side of the grain box, placed in such a manner that the operation of the said parts is brought immediately under the eye of the operator, for causing a single kernel to be deposited at a time in the drill as the machine is moved forward."

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58. For an *Improvement in Seed Planters;* Jacob C. Miller, Marietta, Lancaster county, Pennsylvania, January 23.

The patentee says,—"The nature of my invention consists in the construction and arrangement of the revolving seed distributor and hopper for regulating the quantity of grain sowed, and in the employment of a guide wheel attached to the rear of the axle in the centre, by which the machine can be guided and turned."

Claim —"What I claim as new, is, 1st, the construction and arrangement of the adjustable hopper and grooved roller, combined as set forth, and for the purposes designated. 2d, I claim the centre hind wheel, for guiding and regulating the apparatus."

59. For an *Improvement in Wool Cleaning and Lapping Machines;* Francis A. Calvert, Lowell, Middlesex county, Massachusetts, January 23.

The patentee says,—"The use and purpose of my improvements are to take the cotton or other fibrous material directly from the 'willowing' machine, (where it has been only partially cleaned,) and, by passing it through my apparatus, to pick, open, and more thoroughly clean and separate from the same all foreign substances, and at the same time, and in the same machine, form a more perfect lap for the carding machine, than has hitherto been produced by the common picking and lapping apparatus."

Claim.—"What I claim as my invention, is a toothed cylinder for forming a lap of cotton, wool, or other fibrous material, to be used in lieu of the wire-netted cylinder. I also claim the combination of the burring apparatus, or an apparatus for opening, picking, and cleaning cotton and wool, with the calender and lap rollers."

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60. For a *Combined Double Hinge and Spring;* Andrew B. Taft, City of New York, January 23.

The patentee says,—"This invention consists principally in the construction and application of a double-jointed hinge, which admits of the opening of the door or gate, or other thing, (requiring to open both ways,) in either direction, and in the combination of this peculiar hinge with two springs connected by a chain, whereby the door, gate, &c., is held close to the casing, and also closes itself."

Claim.—"What I claim as my invention, is double-jointed hinges constructed as described, in combination with a chain or cord and two springs, arranged as herein set forth."

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61. For an *Improved Self-Inflating and Folding Life-Boat;* Wm. and Thos. Schnebly, City of New York, January 23.

Claim.—"What we claim, is forming the sides of life-boats of two or more thicknesses of flexible material impervious to both air and water, so arranged, and in combination with gunwales or intermediate gunwales and the bottom, as to form air chambers on both sides of the boat from stem to stern, which may be inflated with air, more or less, by raising up the gunwales or intermediate gunwales from the bottom of the boat, on which they rest when the boat is folded up."

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62. For an *Improved Process of Welding Cast to Wrought Iron or Steel;* M. Fisher and Wm. Martin, Jr., Newport, Penobscot county, Maine, January 23.

The patentees say,—"The nature of our invention consists in properly heating the steel or wrought iron before the cast iron is poured upon it, as described in a patent granted to us, dated the 16th October, 1847, upon which this is an improvement."

Claim.—"We do not claim heating wrought iron in a furnace, and then placing it in a mould and casting iron around it, so as to enclose it therein, that having been done before; but what we claim as new, is heating the steel or wrought iron to which the cast iron is to be affixed, before casting the melted iron upon it, by means of a portion of melted iron poured against that side of the steel which is not to be attached to the finished article. We also claim re-pouring the metal upon the steel, by which much saving in the cost of melting more iron than is required for the casting is saved."

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63. For an *Improvement in Machines for Making Envelopes;* William W. Rose, assignee of J. K. Park and Cornelius S. Watson, City of New York, January 23.

The patentee says,—"The nature of my invention consists in the combining and arranging in a table or frame certain levers or treadles, having upright sliding bars connected thereto, for stamping or creasing the paper for envelopes, and gumming the edges of the same, with a folder frame and folders attached in such manner as, when the treadles are operated upon by the attendant of the machine, the paper is gummed and folded into envelopes at one operation."

Claim.—"What I claim as my invention, is the invention herein described for making envelopes, the same consisting of the stamper rod, the gumming apparatus, and the folding apparatus."

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64. For an *Improvement in Taking Daguerreotype Pictures;* John A. Whipple, Boston, Massachusetts, January 23.

The patentee says,—"My improvement enables me to produce a Daguerreotype miniature of the face of a person resting upon a back-ground, which does not exhibit, to any material extent, the objects in the rear or vicinity of said face, the said back-ground being made to have a cloudy appearance, or one very much like that which is usually given to portraits of faces taken in crayon."

Claim.—"What I claim as my improvement, in combination with the Daguerreotype process, is the above specified mode of arranging and operating an opaque, or partially opaque, screen, having an aperture or its equivalent, the same being placed between the sitter or object and the camera, and put in motion or maintained in position substantially as above specified."

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65. For an *Improvement in Guards or Strippers for Burring Machines;* Alex. Wright, Lowell, Middlesex county, Massachusetts, January 23.

The patentee says,—"By my improved mode of constructing the cylinders, they are believed to be much preferable to others in their operation, while at the same time their first cost is quite inconsiderable in comparison with others, and they are readily susceptible of repair, being then as good as new ones."

Claim.—"What I claim as my invention, is a guard or stripper cylinder, (used in machines for burring wool and cleaning cotton,) constructed with steel strips, for scrapers, arranged and combined with the wooden segments about a roller or shaft."

66. For an *Improvement in Carving Machines;* Hezekiah Augur, New Haven, Connecticut, January 23.

The patentee says,—"My improved machine is, in many respects, very much like the machine described in the specification of letters patent granted to me on the 23d day of December, A. D. 1846, the principal or distinguishing difference being, that my present improved machine is capable of carving or producing copies larger or smaller than the original bas-relief, and in any desired proportion or proportions within its limits, whereas my former machine, or that heretofore patented, would only produce a copy of the same size of the original ornament."

Claim.—"What I claim as my invention, is the peculiar system of jointed parallel bars, moving frame, or two rack bars in combination with each other, and either of the two moving carriages, and made to operate in manner so as to impart to one of said carriages a greater degree of velocity of motion than the other, under the circums'ances, and for the purpose of moving the tablets or chucks, and making a copy of enlarged dimensions. And I also claim the combination of the two sets of carriages, and their two sets or systems of parallel bars, and moving frame and rack bars, as applied together and combined with the tablets, for the purpose of imparting to the tablets lateral and transverse movements at different velocities. And I also claim the frame of each tablet, and the mechanism for giving to it a transverse dip or inclination, in combination with its carriage, and the rocker shaft and mechanism for inclining and turning the tablet in lateral and other directions."

67. For an *Improved Combined Hinge-Fastener and Shutter-Opener;* A. S. Pelton, Clinton, Middlesex county, Connecticut, January 23.

Claim.—"What I claim as my invention, is, 1st, the peculiar manner in which I construct the hinge and propelling rod combined therewith, by which I unfasten, turn back, and secure window blinds, by simply moving the rod outward; and again unhook, turn, and re-fasten the said window blinds, by reversing the movement of the rod, without raising the sash in either operation: that is to say, I claim constructing the rod, with spaces in the side and inclined planes in the top thereof, at the end of the rack, in combination with the inclined planes on the upper half of the hinge.

"2d, I also claim the before described mode of locking the upper and lower parts of the hinge, by means of a hook on the end of the rod entering a corresponding groove in the upper part of the hinge; the rod being prevented from rising by being passed through the mortise in the box of the lower half of the hinge, by which mode of fastening the blind is effectually secured from being raised or opened from outside the building."

68. For an *Improvement in Registers for Hot Air Furnaces;* Charles F. Tuttle, Williamsburg, Kings county, New York, January 23.

The patentee says,—"The nature of my invention consists in the new and improved method adopted in opening or closing the register or ventilator, by means of an upright or vertical wheel, which is connected with, and gives motion to, the valves, by means of a movable connecting rod which is suspended on the side of the wheel or pin projecting therefrom, and this connecting rod is attached to the valves by pins at their ends."

Claim.—"What I claim as new, is the application of the upright or vertical wheel to the opening and closing of registers and ventilators, the edge or top of which is placed flush, or nearly so, with the top surface of the register, and can be acted upon with the foot if desired. This wheel is so placed and connected to the valves by means of a movable connecting rod, which rod is suspended upon a pin projecting from the side of the wheel, and connected or attached to the valves by pins projecting from the ends of the valves at a distance from their centre."

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69. For an *Improvement in Cooking Stoves;* Evan L. Evans, Mount Holly, Burlington county, New Jersey, January 30.

The patentee says,—"The nature of my invention and improvement consists in a peculiar arrangement of the flues, air chambers, dampers, and doors, whereby the oven may be heated or cooled, the draft of the fire increased or diminished, and the heat radiated and diffused, by means of currents of air, throughout the apartment in which the stove is placed, to a greater or less extent, and with greater ease and certainty than the same has heretofore been done."

Claim.—"What I claim as my invention, is the arrangment of the damper, the flues, and the doors, for the purpose of cooling the oven and heating the apartment in which the stove is placed, by promoting the radiation of heat and the circulation of hot air. I also claim the arrangement of the damper, by which the hot air in the flue may be directed into or around the oven."

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70. For an *Improvement in the Reduction of Ores;* Alexander Parkes, Birmingham, England, January 30; (dated in England, Nov. 18, 1847.)

The patentee says,—"My invention relates to the manufacture of metals by the employment of fluxes."

Claim.—"What I claim as my invention, is the above described flux composition, to be used in the manufacture of metals as above specified, the same consisting of muriatic acid, or any chemical equivalent therefor, water, charcoal, coal, or anthracite, or any carbonaceous equivalent therefor, and caustic lime, magnesian limestone, baryta, or any alkaline or earthy chemical equivalent, the same being combined and used in the proportions above represented or in any others which will produce like results."

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71. For an *Improvement in Baking Apparatus;* John P. Hayes, Boston, Massachusetts, January 30.

The patentee says,—"My design in devising my aforesaid new cooking apparatus, was to secure an arrangement of several parallel cooking or baking apartments, one above the other, and so combined with the fire chamber as to provide for cooking meat, bread, or other articles requiring a large amount of heat to penetrate through them, in the apartment immediately over the fire chamber, while in the upper apartments cake and pastry may be thoroughly baked by carrying the smoke, &c., entirely around them."

Claim.—"What I claim as my invention, is a cooking or baking apparatus, having several parallel baking chambers, with divided horizontal flue spaces between them, communicating with vertical flue spaces on each side of them, and so as to make the smoke, &c., pass around said chambers. I also claim connecting said chambers with each other, by the combination of the turning registers in their backs with the vertical hollow shaft."

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72. For an *Improvement in Railroad Trucks;* Jacob G. Day, Brooklyn, Kings county, New York, January 30.

The patentee says,—"The nature of my invention consists in a novel and useful method of constructing wheels and trucks for railways, the said improvements having for their object increased safety in running, and economy of manufacture."

Claim.—"What I claim as my invention and improvement, is giving to the axis of the wheels such an angle as will join their circumferences in the manner described. 2d, I claim giving to the flanches any angle which shall be less than a right angle to the bearing faces of the wheel, so that when the wheels are upon the rails, in their proper position in the trucks, the said flanches shall project under the concave sides of the rails. 3d, I claim the shapes and combinations of the truck frame pieces, so as to form upper and lower bearings for the wheels."

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73. For an *Improvement in Dumping Cars;* Alpheus Nettleton, Springfield, Hampden county, Massachusetts, January 30.

The patentee says,—"My improvement in the manner of constructing a dumping car, not only admits of the body of the car being arranged at the same height above the track as those of the merchandise cars, but presents all the advantages of dumping or discharging earth, coal, or other matters, which are to be found in the common dumping car."

Claim.—"I do not claim the mode of supporting a car body by means of semi-circular arcs or rockers affixed thereto, and made to rest and rock on the top of the truck frame, as the same has heretofore been effected; but that which I do claim is my improvement or mechanism for sustaining and operating the car body, the same consisting in the rollers or small wheels, and their rail or bearing plates, as constructed and combined together, and with the body and truck frame, and made to operate the car body substantially as above specified; my said invention enabling me not only to construct a dumping car much lower than others in general use, but so low as to be used in trains with common merchandise cars."

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74. For an *Improvement in the Manufacture of India Rubber;* H. G. Tyer and John Helm, New Brunswick, Middlesex county, New Jersey, January 30.

The patentees say,—"The nature of our invention consists in forming a compound of caoutchouc, carbonate of zinc, or other preparations of that metal, and sulphur, which is perfectly elastic, impermeable to air or water, unchangeable in extreme temperatures, preserving its color without 'bloom,' and free from the deadly action upon the constitution and health hitherto experienced by the operatives employed in the preparation of metallic vulcanized rubber."

Claim.—"What we claim, is the combination of caoutchouc, in its several varieties, with either carbonate of zinc, sulphate of zinc, or the other salts of zinc, with sulphur, in manner, form, and proportion, as hereinbefore set forth."

75. For an *Improvement in Cooking Stoves;* Joseph Feinour, Philadelphia, Pennsylvania, January 30.

Claim.—"What I claim as my invention, is the combination of the perforated registers with the principal and auxiliary ovens, for the purpose of either establishing a communication between them, or separating them, as herein set forth. I likewise claim the combination of the perforated sliding plate with the plate g', to open and close a communication between the ovens and the flue, the plate g', also, by being removed, furnishing a ready means of access to the flue, for the purpose of cleaning it."

76. For an *Improvement in Cooking Stoves;* R. D. Granger, Albany, New York, January 30.

The patentee says,—"The nature of my invention consists in the manner of introducing highly heated air into the oven of a reverberating or dividing flue cooking stove, the air itself being made to pass around three sides of the oven before entering it."

Claim.—"What I claim as new, is the employment of air passages for the purpose of equalizing and economising the heat in the oven. I also claim the construction for the introduction of heated air into the oven, and withdrawing the same, and passing it under the grate of the fire chamber to support combustion. I also claim the divisions between the fire chamber and oven, to form the air passages illustrated in the body of the description."

77. For an *Improvement in Cooking Stoves;* R. D. Granger, Albany, New York, January 30.

The patentee says,—"The improvements, which are novel, consist in the bottom grate of the fire chamber, composed of a series of tubes, the under sides of which are flat, with a space between each, as clearly shown in the drawing; below this grate there is a sliding lattice damper of common construction, which fits up against the bottom of the tubes, and can be made to close the spaces between them, or partially so, as desired."

Claim.—"What I claim as new, is the combination of the tubular grate, or air-heating tubes, with damper below the same, in the manner described. I also claim the combination of the air-heating grate tubes at the bottom and back of the fire chamber, together with the oblong chamber under the smoke flue, for the purpose of conveying air into each end of the oven, by which a great amount of radiating surface for heating air is obtained with the oven, for the purpose of baking by means of heated air."

78. For an *Improvement in Cooking Stoves;* John L. Gerow, Marlborough, Ulster county, New York, January 30.

The patentee says,—"My improvement consists in forming two diving flues at the ends of the fire chamber, which communicate with the broad flue beneath the oven, (extending the whole breadth of the stove,) and also communicating with the top and back flues. Another improvement consists in making a number of rectangular openings in the vertical transverse plate, arranged between the fire chamber and the oven, through which the draft is made to pass from the aforesaid end diving flues to the broad flue beneath the oven; and also down through the grate and through the middle openings of said plate, by moving the lower register plate to the right or left."

Claim.—"What I claim as my invention, is, 1st, the combination and arrangement of the two end flues with the broad flue beneath the oven, and the flues at the back and top thereof.

"2d, I claim the combination and arrangement of the flues beneath the grate with the broad flue beneath the oven, by which the draft may be made to pass down through the grate and under the same, in order to kindle from the top, by closing the upper register plates and the side flues, and opening the central flues."

79. For an *Improved Lubricating Compound;* Alonzo S. Grenville, Westborough, Worcester county, Massachusetts, January 30.

The patentee says,—"The object I have in view in using the straits or cod-liver oil, in connexion with either the sperm or lard oil, or both, and magnesia, is that it causes the magnesia to be held in suspension in the mixture of oils."

Claim.—"I claim as my invention, the combination of the straits oil with the magnesia and the sperm oil, lard oil, or a mixture of the two, or any oleaginous matter or matters possessing like powers of non-suspension, the same enabling me to make a very cheap and efficient anti-friction oil, to be applied to the lubrication of machinery."

80. For an *Improvement in the Manufacture of Vinegar;* James Ruggles, Philadelphia, Pennsylvania, January 30.

The patentee says,—"The principle of my invention is a discovery which I have made, viz., that the swill or slops of whiskey distilleries, and of other manufactories employing similar materials, contain a large amount of the elements of vinegar. Such slops or swills likewise contain a considerable quantity of other ingredients not capable of forming vinegar, from which it is necessary to free them before completing the chemical process of transforming them into vinegar. Without such purification, the proper rapidity of action could not be attained, and a process of putrefaction would ensue both offensive and deleterious. The nature of my invention consists in the application of means for economising a substance now generally thrown away as useless."

Claim.—"What I claim as my invention, is the making of good wholesome vinegar from the slops or swill, commonly so called, being the waste or spent liquors of distilleries and other manufactories.

"I also claim the making of vinegar from the combinations of slops or swills, waste or spent liquors of distilleries, breweries, starch manufactories, and other workshops in which vegetable substances have undergone fermentation and partial decomposition, with vinous, or alcoholic, or any lacteous, saccharine, or other vegetable materials added thereto, when employed to increase the strength of vinegar, manufactured from said slops or swills, waste or spent liquors.

"I also claim the combination of apparatus for effecting the several successive processes of converting the slops or swills of distilleries and other manufactories, and the mixtures of the same, with other materials added thereto, to increase the strength of the vinegar.

81. For a *Combined Spring Rock Drilling Machine;* Samuel Jack, Jr., Richmond, Lincoln county, Maine, January 30.

Claim,—"What I claim as my invention, is the improvement or combination of springs for supporting and operating the drill, the said combination consisting of the two long springs, and the two elliptical springs of each long spring, one of the same being placed above its end, and the other below the said long spring, the said long springs being connected together, and made to operate and simultaneously raise and lower the drill. I lay no claim to supporting a drill on or by a spring, or on or by a long bar or lever elevated by a cam or other proper contrivance, as I am aware, or think, that in all this there is no novelty; but I rest my claim on the combination of springs for working the drill, as, by my combination, I not only preserve the drill in a vertical line during its movements, but I avoid the disastrous effects which have been usually produced on the machinery by the percussion or the blow of the drill."

82. For an *Improved Machine for Making Suspender Buckles;* Charles A. Lent, Newark, Essex county, New Jersey, January 30.

Claim.—"What I claim as my invention, is the combination of the cross head with the die for forming the buckle, when such cross head is jointed and acted upon by guides, by means of which I am enabled to bend the wire to an angle a little less than a right angle."

83. For an *Improvement in Flood Fences;* John Sourbeer, Mount Joy township, Adams county, Pennsylvania, January 30.

The patentee says,—"The nature of my invention consists in constructing such a fence, that, when the water rises to the first rail, it will raise it out of the mortise in the post at one end, and hold fast by the hook and staple to the post at the other end, and swing round in any course the current may take it, and as the water rises the rails will be raised out one by one, until the water course will have no other obstacle than the posts, and when the water falls, the rails are soon put to their place again."

Claim.—"What I claim as my invention, is the manner of fastening the rails to the posts, that, in opening, they have the full scope of a semi-circle for the current of water to carry them, and on that account will answer for the safety of fences alongside of a water course, as well as those crossing the water course in any direction whatever; and also the shape of the mortise in the post, which I cannot describe better in writing than has been done."

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84. For an *Improved Multiple Grate Furnace for Locomotive Boilers;* Frederick Harbach, Cleveland, Ohio, January 30.

The patentee says,—"The nature of my improvement consists in an arrangement or combination, with the main tubular flue and water section of the boiler of a locomotive engine, of a series of two or more fire boxes, (each including a fire place, grate, and ash pit,) and one or more water chambers or spaces between, or connected with, each two of said fire boxes, the whole being so disposed and made to operate, as not only to greatly increase what is usually termed the grate surface, but the water surface also exposed to the action of the flame or heat proceeding from the fuel in combustion. Each of the said fire boxes is to have all the usual appendages for burning coal (whether anthacite or bituminous) separate from the other; oxygen, or atmospheric air containing the same, in addition to the ordinary draft created by the exhaust steam, being supplied by a blower driven by the main engine or a separate one, as circumstances may require."

Claim.—"What I claim as my invention, is the combination and arrangement of two or more fire boxes, and the water chamber or chambers between them, with each other, and the main boiler and flues, when said fire boxes are arranged vertically over each other; the whole being arranged, constructed, connected, and made to operate, as above specified, and for the purpose of using anthracite coal, and increasing the fire and water surface in boilers whose position is such that it is difficult to extend the fire surface horizontally, and thereby improving the capacity of the boiler to generate steam."

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85. For an *Improved Hinge Claw-Wrench;* Adam Hay, Newark, New Jersey, January 30.

The patentee says,—"The nature of this invention consists in securing to the end of a suitable handle a metallic casting, having a cog formed on one of its sides, and attaching to said casting, by means of a pin, a curved metallic claw, so formed on its inner surface, and moving in such relation to the cog on the side of the casting, as to enable a person to confine different sized nuts or screw bolts between its inner surface and the cog, with sufficient security to turn the same by the application of force to the handle, thus forming a cheap, simple, and efficient wrench, adapted to different sized nuts and bolts, and but little liable to get out of order."

Claim.—"What I claim, is constructing a wrench with a protuberance or cog on its side, and a hinged claw at its end, of the form described and represented in the drawings, in such a manner as to enable a person to grasp and turn screw bolts and nuts of different sizes with the same."

86. For an *Improved Roller Weather Strip;* Hiram C. Brown, Xenia, Greene county, Ohio, January 30.

The patentee says,—"The nature of my invention consists in providing, of any known materials, a roller for the bottom of doors and windows, enclosed in a groove and supported as described."

Claim.—"What I claim as my invention, is the combination of a roller in a groove with the bottom of a door or window, and threshold with a rebate in it, the said roller having play in its bearings, and the whole constructed and acting as described."

87. For a *Mill for Rolling Irregular Shapes by means of a Cam Pattern;* John S. Hall, Columbus, Franklin county, Ohio, January 30.

The patentee says,—"The nature of my invention consists in connecting with the rollers of an ordinary rolling mill a cam shaft, with cams thereon, to act upon the boxes in which the upper roller turns, so as to cause it to rise and fall, to draw bars to any pattern; by changing the relative size of the gearing, I am enabled to make on a small cam a sufficient pattern for rolling a long bar, thus making a compact and a variable machine by simply changing, or, when the peculiar character of the pattern requires it, making the cam move faster, so as to reduce the pattern."

Claim,—"What I claim as my invention, is the employment of cams for elevating and depressing the top roller of a rolling mill, in combination with gearing, the same as set forth, so that a pattern of any length on the cam may be made to affect the surface of any given length of bar, in proportional ratio, by change of the relative size of the gearing, by which I avoid, in rolling long bars, any long patterns, difficult to handle and expensive to construct."

88. For an *Improvement in Cooking Stoves;* William Stephenson, Cincinnati, Ohio, January 30.

The patentee says,—"My invention and improvement consists in constructing the stove with vertical ascending and descending side flues in the sides of the stove, in which the oven doors are usually placed, and between the doors and corners of the stove, through which the smoke and heat are caused to pass to a horizontal flue between the oven and fire chamber, and through a flue beneath the oven. Also in the arrangement of a sliding register plate in the back flue of the stove, which, when open, will cause the draft to be from the fire chamber down the back corner flues, and up through said register plate directly to the smoke pipe. Likewise in the arrangement of a movable fire back in the fire chamber, for the purpose of increasing or diminishing the capacity of the fire chamber at pleasure, by moving said back toward or from the front of the stove."

Claim.—"What I claim as my invention, is, 1st, the arrangement of the vertical descending and ascending flues, constructed in the side plates of the oven, between the oven doors and the corners of the stove, in combination with the flues leading from the middle flue to the smoke pipe; and, in combination with these, I claim the arrangement of the sliding register."

DESIGN.

1. For a *Design for Stoves;* N. P. Peck, Spingfield, Hampden county, Massachusetts, January 23.

Claim.—"What I claim as my invention or production, is the combination of ornamental mouldings and carvings, or configurations, herein above described and represented in the drawings, for the side and back plates of a cooking stove."

List of American Patents which issued in the month of February, 1849, *with Exemplifications by* Charles M. Keller, *late Chief Examiner of Patents, in the U. S. Patent Office.*

1. For an *Improvement in Cooking Stoves;* James White, Milton, Northumberland county, Pennsylvania, February 6.

Claim.—"What I claim as my invention, is, 1st, making the cook stove with a cylindrical chamber of combustion, having a vibrating grate at the bottom thereof, arranged above the oven at the back of the ordinary chamber of combustion, in combination with a rectangular fire chamber for the burning of wood, and four descending flues, two of which merge into a large flue in front, made the full breadth of the stove, and decreasing in width until it intersects a horizontal flue beneath the larger oven, made the length and breadth of the stove, leading into the usual central flue at the back, said coal and wood fires being used together or separately as preferred; the front descending flue being made to lessen in width as it descends towards the bottom flue, for the purpose of spreading the draft more equally beneath the oven.

"2d, I also claim extending the oven upward behind the cylindrical coal chamber, and the space occupied by the fire chambers, for the purpose of obtaining the radial heat of the convex surface of the cylinder in the upper portion of the oven."

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2. For an *Improvement in Tops for Wire Ropes;* John A. Roebling, Saxonburg, Butler county, Pennsylvania, February 6.

Claim.—"What I claim as new and as my original invention, is the construction of a conical 'top,' with two or more circles of notches, which vary in depth and extent, so as to suit the passage of the different circles of wires which are to compose a compound strand, thereby uniting the advantages of a perforated plate with the easy curves of a common top. I also claim the application of one or more rings or bands, for the purpose of keeping the different circles of wires apart, as well as to keep the wires separate amongst themselves."

3. For an *Improvement in Cooking Stoves;* Geo. B. Whiteside, Brockport, Monroe county, New York, February 6.

The patentee says,—"The following are the purposes of my invention: 1. To moderate the heat and prevent the destruction of the back fire plate of my stove, without allowing the over-heated air and disagreeable effluvia thence arising, either to pass into the apartment containing the stove, or to be thrown into the oven, where its effects would be injurious rather than beneficial to the food baked therein. 2. To ventilate the oven, by allowing a ready escape of the vapors and gases from the baking through openings in the highest part of the oven, without, however, admitting dust or soot from the combustion to fall upon the food. 3. To ventilate the boilers placed over the fire, and avoid the disagreeable odors thence arising, without involving the necessity of using long and inconvenient conducting tubes to convey away the fumes. 4. To bring into a compact and sightly form the apparatus for effecting all the above purposes, and maintaining symmetry of appearance, while freeing the apartment from the disagreeable odors generally prevalent where culinary operations are carried on."

Claim.—"What I claim as my invention, is the horizontal ventilating passage between the top plate of the stove and the top plate of the oven, separate from the flue which carries the burnt gases, arranged in the manner, and acting to effect the several purposes of ventilation, substantially as herein set forth.

"2d, I also claim the air passage leading from the top of the air chamber back of the fire plate, in combination with a ventilator passage independent of a smoke flue, constructed and acting to carry away the overheated air from said air chamber, in the manner set forth.

"3d, I also claim, in combination with a horizontal ventilating flue, separate from the smoke flues and crossing the top of the oven, the ventilating passages in the top plate of the oven, having a regulating slide which adjusts the opening into the ventilating flue, as herein described.

"4th, I also claim, in combination with a horizontal ventilating passage, separate from the smoke flues, and between the top plate of the stove and the top plate of the oven, the front opening, whereby the front tier of boilers is ventilated without interfering with the position or with the convenient use of the other boilers, and without mixing their steam with the gases from the fire, and cooling them while passing round the oven, in the manner set forth; but I do not claim the general principle of conducting away steam by pipes leading into smoke flues or chimneys."

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4. For an *Improvement in Machinery for Spinning Hemp;* Wm. Pedrick and Thos. M. Melvin, Charlestown, Middlesex county, Massachusetts, February 6.

The patentees say,—"The peculiar object of our improvement is to produce a constantly increasing draft on the bobbin, sufficient to enable it to take up the yarn as fast as spun, and as the diameter of the cylinder of yarn wound on the bobbin increases in size."

Claim.—"What we claim, therefore, as our invention, is the combination of levers, or any mechanical equivalent or equivalents, a screw and weight, or any mechanical equivalent or equivalents therefor, and the pulley and friction plate, the whole being applied and operated together, and so as to actuate the bobbin, substantially in the manner and for the purpose as specified."

5. For an *Improvement in Hoisting Apparatus;* Elijah Learned, Boston, Massachusetts, February 6.

Claim.—"What I claim as my invention, is the friction disk, the driving wheel, and the system of levers or leverage applied thereto, as combined together and with the hollow windlass barrel, and made to operate substantially as specified; and I also claim the combination of the same and the spring weighing apparatus, which serves not only to present to the action of the friction apparatus, under certain circumstances, the relief of a spring, but also to determine the approximate weight of a body raised by the machinery."

6. For an *Improvement in Cooking Stoves;* Elisha Vance, Wilmington, Clinton county, Ohio, February 6.

Claim.—"What I claim as new, is the combination of the diving flue with the flues F, arranged as described, for the purpose of evenly distributing and equalizing the heat on the four sides of the oven, without using or requiring dampers."

7. For an *Improvement in Plates for Boiler Holes and Tops of Stoves;* John B. Chollar, Albany, New York, February 6.

The patentee says,—"The nature of my invention consists in forming a protective shell or case in the form of a tray or trough of cast iron, and so adapting it to the under side (next the fire) of the centre cross piece as to protect it from the heat of the fuel needed to be used for culinary or other purposes, thereby avoiding the loss of the centre or cross piece by its settling when heated."

Claim.—"What I claim as my invention, is the application of a hollow shell of cast iron as a protective plate, in connection with the holes A A, to centre or cross pieces for cooking stoves and ranges."

8. For an *Improved Method for Boring Gun Barrels;* Henry Peeler, Boston, Massachusetts, February 6.

The patentee says,—"My process of boring consists in using a twisted drill, as usual, but in connexion with others."

Claim.—"What I claim as my invention, is the above described mode or process of boring gun barrels, or articles of like character, the same consisting in using the three drills, X Y Z, in the order and manner specified."

9. For an *Improvement in Cooking Stoves;* William Cobb, Albany, New York, February 6.

Claim.—"I claim the special combination and arrangement of hot air, fire, and heated gas channels and flues, in connexion with the heating and culinary apparatus of a cooking range or stove, as described."

10. For a *Bolt and Disk Sectional Cannon;* Jesse Fitzgerald, City of New York, February 6.

Claim.—"What I claim as my invention, is the combination of metallic plates and bolts in the manner above described, to construct a cannon."

11. For an *Improvement in Rotary Cutter Ploughs;* Thomas J. Tuthill, Elmira, Chemung county, New York, February 6.

Claim.—"What I claim as my invention, are the rotary cutters and screw shaft, in combination with the wheel and handle shafts, arranged in the manner and for the purpose described."

12. For an *Adjustable Lever Cut-Off with Secondary Toe No.* 1; Horatio Allen, City of New York, February 6.

Claim.—"What I claim in this invention and combination, is, 1st, the use of a secondary toe having a fixed centre, which toe is moved by a motion taken from the usual rock shaft, and is lowered by a motion coincident with that of the piston, and by means of which the valve can be raised and returned to its seat at any portion of the stroke without concussion.

"2d, The use of a double fulcrum lever, the ends of which are alternately sources of motion and fulcra, and by means of which, in combination with motions which are nearly at right angles to each other, the valve will be raised at the commencement of the stroke, and then restored to its seat at such part of the stroke as the adjustment provides for.

"3d, The use of the adjustable piece, by means of which the proportion of cut-off is changed.

"4th, The mode of working the steam valve, by the combination of the secondary toe, lever, adjustable piece, and arm, substantially as set forth."

13. For an *Adjustable Lever Cut-Off with Secondary Toe No.* 2; Horatio Allen, City of New York, February 6.

Claim.—"What I claim, is the combination of the lever, adjustable piece, and toe, with the lifting rod, by means of which the valve is raised at the commencement of the stroke, and the combination of the lever, link, and arm, with the cut-off rock shaft, by means of whicn the valve is lowered to its seat."

14. For an *Improvement in Music Stands;* Henry W. Holly, Stamford, Fairfield county, Connecticut, February 6.

The patentee says,—"The nature of my invention consists in making a stand for holding books for music, &c., and having facilities for turning the leaves of music or books over at pleasure, without the use of the hands."

Claim.—"What I claim as my invention, is the combination and arrangement of an apparatus with the music or book stand, which apparatus consists of the connecting bar, crank, and the second crank to slide the catch bar."

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15. For an *Improvement in Cutting Boot Heels;* Philander Shaw, Abington, Plymouth county, Massachusetts, February 6.

Claim.—"What I claim as my invention, is a combination composed of the following elements, viz., the inclined plane or bed, the curved cutters, and machinery for depressing them, and expanding or separating them during their descent, the whole being constructed and made to operate as specified; not meaning to confine each or any member of the said combination to the exact form, shape, or construction, as described and exhibited, while it may be possible to vary the same without any substantial change of the whole combination, but to employ any machinery which may be considered a mechanical equivalent for such member. And, in combination with the bed and cutters, I claim the bent lever, or any mechanical equivalent, the same being for the purpose as hereinbefore explained."

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16. For a *Piston Valve Inclosed in the Steam Cylinder;* Isaac L. Bennett, Westerloo, Albany county, New York, February 6.

Claim,—"What I claim as my invention, is the employment of the two sliding ring valves, in combination with the cylinder and reciprocating piston, for admitting the steam to, and discharging it from, the cylinder in reciprocal succession, by the alternate direct action of the piston on the ring valves, and without the intervention of any other agents, whether the valves be connected in the manner described, or in any other way which is substantially the same, and by which analogous results are produced."

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17. For an *Improved Lever Scale for Canals, Railroads, &c.;* Eli Ellicott and Samuel A. Abbot, Philadelphia, Pennsylvania, February 6.

The patentees say,—"The nature of our invention consists in placing upon each side of the top or base of the lock, dock, canal, or other desired place, two chairs or supports at proper distances apart, to keep in position the suspended levers, (which are simple levers having fulcrums,) and running parallel to said lock, dock, railroad, &c., which levers give the first action to the scale, and, by the multiplication of said chairs and levers, the scale may be extended to any required length."

Claim.—"What we claim as our invention, is the combination with each other of two or more simple horizontal chairs, placed on each side of the top or base of a lock, canal, dock, railroad, or other desired place, and running parallel thereto, by which means the scale may be extended to any length, from the smallest to the greatest, with entire accuracy, and by the multiplication of said levers, can be obtained a scale strong enough for any purpose; the whole operating substantially as described."

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18. For an *Improvement in Dumping Wagons;* William H. Start, Smyrna, Kent county, Delaware, February 6.

The patentee says,—"The nature of my invention consists in so arranging the body of a wagon that it may be run back on friction wheels, until its centre of gravity is brought over the axletree of the hind wheels, when it is tipped or tilted up, to dump or discharge its load, springs being arranged to prevent any sudden concussion or jar when the box is turned and slips down."

Claim.—"What I claim as my invention, is the arrangement of the cavities, in combination with the friction rollers, whereby the box is moved backward and forward (preparatory to and after tilting its load) easily and but with little friction, and when in place rests upon, and in contact with, the sides of the frame throughout its entire length, which greatly increases the strength and durability of the wagon."

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19. For an *Improvement in Sewing Machines;* Charles Morey and J. B. Johnson, Boston, Massachusetts, February 6.

The patentees say,—"The kind of sewing which is effected by our machine is what is generally called 'chain-stitch;' that is to say, the thread is passed through the cloth in the form of loops, each one of which is passed through the one next to it and in rear of it. The formation of the loops or stitches, and their interlacement, are produced in a very simple manner by the united operations of a needle and a hook."

Claim.—"In the above machine we claim as our invention the combination of a needle and a hook, as constructed and made to operate together substantially in the manner and for the purpose of sewing cloth, (or any other material or materials capable of being sewed,) as specified."

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20. For an *Improvement in Ploughs;* Joseph C. Cloud, May's Landing, Atlantic county, New Jersey, February 6.

Claim.—"What I claim as new, is, 1st, the employment of what I have denominated the auxiliary furrow side, forming a broad bearing at the heel of the mould-board, which is to be formed and combined with the plough, either in one piece with the mould-board, or by an additional casting. I also claim the fastening of the cutter, extending down on the landside to the bottom of the plough, by means of a mortise through it that receives the tenon on the wrought iron plate, and which plate is bolted to the mould-board. I claim the particular manner in which I secure the point and share to the cutter, by means of the plate having a tenon thereon and the ordinary screw bolt, as described."

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21. For an *Improvement in Cheese Presses;* Lansing Kellogg, Ravenna, Portage county, Ohio, February 6.

The patentee says,—"The nature of my invention consists in placing between a pair of toggle joint levers, and a screw which operates therein, an elliptical or other spring, in such a manner that it is compressed by the force applied by the screw to the levers, and, by its effort to expand again, has the effect of continuing the pressure of the levers upon the cheese, or whatever substance is placed between them, and the platen, after the screw has ceased to operate."

Claim.—"What I claim as my invention, is the combination of the spring with the screw and toggle joint, as herein set forth, or in any other substantially similar manner by which the same effects are produced."

22. For an *Improvement in Coloring Bricks;* Cyrus B. Doty, Cortlandt, Westchester county, New York, February 6.

The patentee says,—"The nature of my invention consists in providing certain suitable facings upon the outside of bricks, by which I obtain a uniform color or an ornamented surface, either at pleasure."

Claim.—"What I claim as my invention, is the peculiar process and manipulations of mixing coloring materials with the moulding sand for the surface of bricks, and the pressing the same upon and into the surface, so as to produce bricks of a uniform color upon the surface, as well as of a uniform shape and smoothness, the same being effected with greater economy than by mixing a sufficient quantity of coloring matter to color the whole body of the brick; and this regardless of any particular coloring matter or especial color to be produced when the bricks are burned."

23. For an *Improvement in Camphine Lamps;* Edwin B. Horn, Boston, Massachusetts, February 6.

The patentee says,—"The object of my improvement is to procure for the lamp two very important advantages, viz., that of a reduction of shadow peculiar to astral and other lamps, wherein the burner is made to extend through or into the fountain; also that of keeping or maintaining the camphine or volatile oil in the fountain at, or about at, its ordinary atmospheric temperature, in order that all or nearly all that portion of it which, in camphine lamps, wherein the fountain is made of glass, and the burner is made to extend into or through it, and in direct contact with and through the fluid in it, is, by heat, transmitted through the burner, usually evaporated through the top of the fountain and wasted, may be saved and burned with the remainder."

Claim.—"What I claim as of my invention, is the manner in which I construct the fountain, in order to allow the rays of light proceeding from the wick of the burner to pass downwards through both the internal and external concentric sides or shells of the fountain: that is to say, I claim an internal translucent side or shell, in combination with an external concentric translucent side or shell, whether the said two concentric translucent sides of the said fountain be connected together by a translucent or opaque bottom."

24. For an *Apparatus for Ascertaining the Saltness of Water in Steam Boilers;* William Sewall, Jr., Williamsburg, Kings county, New York, February 6.

The patentee says,—"The nature of my invention consists in constructing and arranging an apparatus containing a hydrometer, and with or without a thermometer, and so connected with a steam boiler as to readily pass a current of water from any part of the boiler through it, for the purpose of ascertaining at all times, by inspection, the exact degree of saltness of the water at such desired part of the boiler."

Claim.—"What I claim as new, is the employment of a cylinder containing an hydrometer, and with or without a thermometer, said cylinder being connected with a steam boiler, and constructed and arranged substantially as set forth, with a current of water passing from the boiler through it, which is kept always at the same height in the cylinder by means of a waste pipe, as described. And I further claim connecting said cylinder with the interior of the boiler by more than one pipe, at different levels, so that the saltness at any level can be determined."

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25. For a *Method of Regulating the Supply of Water to Steam Boilers;* Warren S. Bartle, Newark, Wayne county, New York, February 6.

The patentee says,—"The nature of my invention consists in regulating the quantity of water forced into steam boilers, and thus maintaining it at a uniform height therein, by means of a float placed in the boiler, or in a chamber communicating with it, which float, by its rising and falling, directs the points of one or more clicks, moved longitudinally to and fro by the engine, alternately upon or away from adverse ratchets attached either to a cock in the pump, so as to turn the cock alternately one way and the other, and admit and shut off the water in its passage to the boiler, (the pump all the while moving,) or to a lever moving a clutch or other device, which stops and starts the wheel, pulley, or shaft, that drives the pump, and thus starts and stops the pump."

Claim.—"What I claim as my invention, is regulating feed in boilers by means of an arrangement of a float, a rocking shaft, kept in constant motion by the engine, vibrating clicks, and circular or straight ratchets, acting upon the cock stem, valve spindle, or pump shaft, so that the float is required to exert no direct force to regulate the supply, the whole machinery constructed and acting as described."

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26. For an *Improvement in Wire Fences;* Henry Jenkins, Pottsville, Schuylkill county, Pennsylvania, February 13.

The patentee says,—"My invention consists in forming a fence of wrought iron in a cheap and economical manner, by the construction and arrangement of its several parts, by which a light and durable fence, of a highly ornamental character, can be made at as cheap a rate as one formed of cast iron, and in many cases cheaper."

Claim.—"I claim constructing the wrought iron wire fence, by forming the top and bottom rails and posts of the panel, of grooved bars, through which the ends of the wires, of which the meshes are made, are drawn, and the ends turned down into said grooves and then covered by other similar bars to hold them in place, by which a perfect finish is effected, and the expense and difficulty of riveting is avoided."

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27. For an *Improvement in Apparatus for Heating by Vapor of Alcohol;* Thomas K. Anderson, Painted Post, Steuben county, New York, February 13.

The patentee says,—"The nature of my improvement consists in the arrangement and construction of an apparatus that will, by its own heat, generate the substance for combustion sufficient to become a self-feeder, and with the parts arranged in a manner that fits it for heating rooms, generating steam, and other similar and useful purposes."

Claim.—"What I claim as new, is the combination of a reservior for holding the material to be burned, having a tube running through it in any convenient direction, with one or more small pipes or burners leading from the top thereof, and introduced in an angular direction near the bottom, as set forth, so as to cause the blaze therefrom to impinge on the side of the tube, the heat of the blaze causing a sufficient and constant supply of vapor to the burners without the aid of an auxiliary heater, and all the surplus heat being directed through the tube to the top thereof, for heating purposes. I also claim, in combination with said burner or burners, one or more jets leading into the current issuing through the tube for increasing the heat."

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28. For an *Improvement in Self-Acting Presses;* Almeron McKinney and David Tyler, Clarksfield, Huron county, Ohio, February 13.

The patentees say,—"Our improvements consist in applying the power of compression through a cam and lever acting upon the piston upon which the platen rests, and supported by a stirrup, instead of applying it through a lever turning upon a fulcrum, and acting upon a pivot attached to the stem of the platen; also, in maintaining the platen in a horizontal position, by means of parallel rods turning on pivots."

Claim.—"What we claim as our invention, is the combination of the cam, lever, and head, with the platen, press beams, and parallel levers, whereby the platen is maintained in a horizontal position at every elevation, and the compression effected by the lever and cam, without passing pins through them as fulcra for them to turn on, thus avoiding the splitting of the levers and other arrangements, which are productive of so much inconvenience in presses heretofore constructed upon similar principles."

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29. For an *Improvement in Door Locks, by which one keyhole serves for two distinct keys;* Amos Call, Springfield, Hampden county, Massachusetts, February 13.

The patentee says,—"My improvements consist in applying a detached slide to move the common latch bolt, the slide operated on by a key put through one end of a double-ended keyhole, the other end of which receives another key, to move and work a standing bolt, that permanently secures the door to which the lock is attached."

Claim.—"What I claim as new, is the application of such a keyhole to receive a different key at each end, such keys acting singly or successively to withdraw or project the night or standing bolt, or act upon the latch bolt by the intermediate slide, as these are all applied and conjoined for these purposes."

30. For an *Improvement in Composition for Filling Teeth;* Asa Hill and Samuel G. Blackman, Norwalk, Fairfield county, Connecticut, February 13.

The patentees say,—"This article is made by taking the gutta percha of commerce, freeing it from its impurities and coloring matter by boiling and working it, or by maceration, and combining with it, when sufficiently heated with a dry heat to render it plastic, about two parts quick lime, and two parts each of quartz and feldspar, all reduced to an impalpable powder."

Claim.—"What we claim is the combination of gutta percha as a base, with such other mineral, earthy, and metallic substances, as will make such a compound, of such a character, and adapted to such purposes, as we have described, viz., its combination with such of those substances as will shorten it and render it less tenacious, harden it and render it fit for a useful filling, and give it the desired color, without any noxious quality, and without destroying its plasticity when heated; and the application of the compound substance for that purpose."

31. For an *Improved Combination Revolving Tumbler Lock;* Linus Yale, Newport, Herkimer county, New York, February 13.

The patentee says,—"The invention now claimed by me consists of a series of improvements on a lock patented by me on the 13th day of June, 1844, in which the locking bolt is thrown out and in by a pin on the face of what I term a 'rotating tumbler,' which works in a groove in the face of the bolt, the said rotating tumbler being operated by a key, which, as it is inserted, forces out to the required distance a series of radial stops, that pass through holes in a cylindrical tumbler, and enter corresponding holes in a surrounding hollow cylinder. In the lock, as improved by me, I employ two series of rotating tumblers, one to operate the main bolt, and the other to operate a stop against the main bolt, which, according to its position, either holds the bolt in place to prevent it from being thrown back, or leaves it free to be moved.

"The principle of the first part of my invention consists in combining with the main turning tumbler, that operates the main bolt, a sliding bolt and turning plate connected with the tumbler, which sliding bolt being adapted to slide within the turning plate, and the two so connected and adjusted, as that the turning plate cannot turn except when the sliding bolt is in a central position relatively to the plate and tumbler, so that this position of the sliding bolt must be attained before the bolt of the lock can be operated; the sliding bolt being provided with a keyhole which only coincides with the keyhole in the tumbler when it (the sliding bolt) is thrown out to lock the turning plate and tumbler connected therewith, so that when the said sliding bolt is in its central position, to admit of the turning of the tumbler, it shall cover the keyhole to prevent the admission of it.

"The second part of my invention consists in employing, in combination with the rotating tumbler and sliding bolt, which covers the keyhole when in a central position, to admit of turning the tumbler, a key, which, when inserted in the keyhole, will admit of removing the handle, that it may remain in place and admit of closing the keyhole above it, to place the sliding bolt in a central position relatively to the tumbler.

"The third part of my invention, which relates to the composition or permutation tumbler that operates the stop, to prevent the main bolt from being thrown back, consists in combining therewith a sliding bolt, which covers the aperture leading to the keyhole, and which only admits of the turning of the tumbler when it closes the keyhole, and an eccentric turning plate and thumb piece, which operates it and the sliding bolt, the said eccentric being made to traverse over and close the keyhole before the tumbler can be operated. And this part of my invention also consists in combining with the parts thus combined, a key, which, when inserted, will admit of moving the sliding bolt and eccentric over it to close the keyhole, the said sliding bolt being enclosed within a cap plate secured to the front plate of the lock, and adapted to the turning of the sliding bolt within it."

Claim.—"What I claim as my invention, is the combination of the sliding bolt with the rotating tumbler, for the purpose of locking the tumbler independently of the permutation stops.

"I also claim the turning plate, in combination with the sliding bolt and tumbler, by means of which the motions of the sliding bolt are regulated, and its combination with the tumbler effected.

"I also claim, in combination with the tumbler and the sliding bolt, the employment of a key, which, when inserted, will permit the sliding bolt, in unlocking the tumbler, to close up the keyhole over the key, by means of which combination, the tumbler must be locked to admit of inserting the key, and the key must be shut into the keyhole to admit of unlocking the tumbler.

"And finally, I claim, in combination with a rotating tumbler, and the sliding bolt by which it is locked and unlocked, the employment of the turning eccentric plate, which operates the sliding bolt, and, at the same time, also closes up the keyhole."

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32. For an *Improved Nipper Saw-Set;* Jacob Muzzy, Eddington, Penobscot county, Maine, February 13.

Claim.—"What I claim as my invention, is the improved organization described: or, in other words, the hand-rest or handle, the arm and screw, the spring lever, the jaws or bed A, and jaw *b* of the lever, the adjustable bed screw and arm, in combination; the whole being constructed and made to operate together as described."

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33. For an *Improvement in Apparatus for Removing Animals from Railroads;* Louis Montgilion, Elk Ridge Landing, Anne Arundel county, Maryland, February 13.

The patentee says,—"It is the object of my invention to obviate the destructive action of the common cow-catcher, while attaining all the good results of the same in clearing the track of living or other obstacles. My life-preserver contemplates not only the prevention of the destructive effects of locomotives as now used, but also the speedy removal from the track of such objects as it may chance to encounter. My invention provides for placing the machinery in a compact form for stowage at depôts and stations."

Claim.—"What I claim as my invention, is, 1st, the manner of avoiding destructive violence to the limbs and bodies of animals, by terminating the fingers of my machine with elastic rollers, rendering the fingers capable of a limited vibration to suit the action of those rollers, and placing above the fingers a movable elastic cushion or buffer, to receive the direct action of the animal which may be thrown upon the fingers.

"2d, I also claim making the front part or fingers of an oscillating life-preserver to raise by the act of encountering an animal on a railroad, in such manner as to lift the animal from its feet clear of the track, whereby the life and limbs of the animal are preserved, and the danger of throwing the train from the track is avoided.

"3d, I also claim the arrangement of machinery, composed of the cushion, the sliding rods, the thrusting bar, the trigger, the latch bar, the latch, the notch, combined and acting to produce the effect of elevating the fingers of the railroad life-preserver when encountering an animal on the road.

"4th, I also claim the arrangement whereby the fingers of a life-preserver are, while in motion, made to receive at pleasure, a limited horizontal deviation from their ordinary line of direction, in order to arrest an animal near one side of the track.

"5th, I also claim, in combination with the T-shaped frame, and weighted oscillating frame of my life-preserver, the jointed fingers, folding backwards, and the jointed rack frame and cushion, withdrawn and folding forwards, to produce a compact stowage when in depôt.

"6th, I also claim the jointed, revolving, elastic life-preserver, combined with a pivot-truck, having a circular bearing for friction rollers, and also having check-arms, for producing and limiting the horizontal motion of the fingers."

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34. For an *Improvement in Setting Teeth;* F. Hamilton Clark, City of New York, February 13.

Claim.—"What I claim as my improvement, is the mode and manner of securing the cylinder in its place, by means of the perforated or solid screw passing through the bottom of said cylinder, into an opening in the root of a tooth prepared to receive it."

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35. For an *Improvement in Water Wheels;* James Trees, Salem, Westmoreland county, Pennsylvania, February 13.

Claim.—"What I claim as my invention and improvement, is making the shell of the wheel of the peculiar form described and represented," (that of a conch or dolium shell,) "in combination with the circular plate, central core, and spiral buckets, discharging on the same side of the shell."

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36. For an *Improvement in Spark and Gas Consumers;* David Matthew, Baltimore, Maryland, February 20.

Claim.—"What I claim as new, is the manner in which I have constructed and arranged the respective parts that constitute the inner and outer cases of the apparatus which is placed at the top of the chimney; and also the manner in which these are combined with the fire box: that is to say, I claim the manner of constructing and arranging the trumpet-mouthed tube within the inner case, said tube being divided into two or more parts, and being made to deposit and discharge the larger portion of the sparks, by the aid of the opening between the parts. I also claim the manner in which I connect the apparatus at the top of the chimney with the furnace or fire box, by means of the tube or pipes, the cases, and the openings, thence into the fire box or furnace, for the purpose made known. I likewise claim the manner of preventing the entrance of water into the fire chamber, by the employment of the tubes M, in combination with the tubes H H′."

37. For an *Improvement in the Manufacture of Pearl-ash;* William A. Edwards, Clinton, Macomb county, Michigan, February 20.

The patentee says,—"The nature of my invention consists in converting the ashes into pearl-ash without leaching, and by only one boiling process of lye, instead of leaching the ashes and performing two boiling processes, in the old common way. The mode I use is by burning or scorching the ashes in a pearling oven, then boil them, then settle in settling tubs, then dip the liquor into kettles and boil to white salts, and lastly pearl in the pearling oven."

Claim.—"What I claim as my invention, is the process of first roasting or heating the ashes, once dissolving, and then pearling in the pearling oven; thereby saving the expense of the leaching apparatus and one boiling operation."

38. For an *Improvement in Apparatus for Warming Apartments;* Samuel Whitmarsh, Northampton, Hampshire county, Massachusetts, February 20.

The patentee says,—"My object in making this invention has been to produce an efficient, economical, and safe apparatus for heating air, by the circulation of hot water through suitable radiating vessels, and to provide the same with such a contrivance as would not only prevent explosions of the pipes or water vessels, in consequence of the generation and accumulation of steam therein, but would condense said steam, and return it in the state of water into the radiators or heating vessels. Besides the above, I have sought to regulate the supply of fuel, (in case a combustible liquid is employed,) so as to maintain an equality of temperature of the air warmed by the apparatus."

Claim.—"What I claim as my invention, is the combination of the vapor condenser, with one or more radiators, and the water chamber surrounding the furnace; also the arrangement of the said condenser, and air inlet and outlet pipes of its external case, in such manner that the cold air, previous to its entrance into the air-heating chamber, shall be brought to impinge directly against the condensing vessels. I also claim the mode of making one or more sides of the radiator serpentine in transverse section, as described."

39. For an *Improvement in Drying Machines;* Nelson E. Chaffee, Ellington, Tolland county, Connecticut, February 20.

The patentee says,—"The nature of my invention consists in providing a wheel composed of two circular sides, united together by an axle passing through the same, so as to leave a space between the said two sides, the which space I divide into four separate chambers by wire wicker work, into which I put the wool or cloth to be dried, and, by giving the wheel a greater velocity, the air impinges through the wicker work on the periphery of the wheel on the cloth or wool, and dries the same in an incredibly short period."

Claim.—"What I claim as my invention, is a wheel divided into chambers, open to the free circulation of the atmosphere around the periphery, and through the passage around the interior parts of the chamber; also for the purpose set forth. I do not confine my claim to the chambers formed of iron wires or rods; for some purposes wood would be preferable; neither do I confine my claim to four chambers in the wheel, but to two or more formed as described."

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40. For an *Improved Block for Supporting Bilges and Keels of Vessels;* Francis Grice, Washington, D. C., February 20.

Claim.—"What I claim as my invention, is the combination of the two legs, and the horizontal table supported by them, with the pawls at their feet, and the rectangular frame and its pawls and ratchet, the whole to be acted upon by devices for giving a coincident motion of the legs towards each other, and constituting a support for the bilge or keels of vessels when taken in dock."

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41. For an *Improved Electro-Magnetic Ore Separator;* Ransom Cook, Plattsburg, Clinton county, New York, February 20.

Claim.—"What I claim as my invention, is, 1st, the use and application of a revolving cylinder or drum, with the poles of electro-magnets on its periphery, for and to the purpose of separating the magnetic oxide of iron from the substances with which said oxide may be found associated, by causing the said electro-magnets, when revolving as component parts of such cylinder, to be successively charged to take up the ore, and subsequently discharged to part with it; the charging being effected by bringing the windings of such electro-magnets in connexion with an acting galvanic battery, and the discharging by breaking such connexion.

"2d, For the purpose of separating such ore, I likewise claim the use and application of four or more terminations to the poles of electro-magnets."

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42. For an *Improvement in Artificial Legs;* Benjamin F. Palmer, Meredith, Belknap county, New Hampshire, February 20.

Claim.—"What I claim as my invention, is, 1st, the combination of the horizontal arm with the knee bolt, connected with a cord and spring, in such a manner as to possess a varying tendency to extend the flexed limb according to the position of the same.

"2d, I claim the use of a combination of the double coiled re-curved foot spring with a bolt, and with downward and backward projecting arms, acting at once to flex the foot and to extend the toes.

"3d, I claim the use of a combination of the stop bolt with a movable heel.

"Lastly, I claim the manner of connecting the toe-piece with the foot, when the said toe-piece is operated on by the cord and spring to extend it."

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43. For an *Improvement in Horse Rakes;* Samuel H. Grinnell, Charlestown, Sullivan county, New Hampshire, February 20.

Claim.—"What I claim, is the application of the crank levers and handle for rotating the rake-head, for charging and discharging the rake."

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44. For an *Improved Attachment of Loading Muzzle of Rifles;* Danl. Smith, Scipio, Cayuga county, New York, February 20.

Claim.—"What I claim as my invention, is, 1st, the hinge attachment for connecting the muzzle to the barrel. 2d, The application of the muzzle to and for the use of the muzzle thimble for the ramrod."

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45. For an *Improvement in Fire-Kindling Materials;* Levi T. Cheever, East Greenwich, Kent county, Rhode Island, February 20.

The patentee says,—"The particular object of my invention is to kindle fires, and in making it I have tried to combine mineral combustible materials not easily ignitable, with vegetable combustible materials, cheap, easily procurable, and of easy ignition in comparison with the mineral matters, and to do so by one or more vehicles of resinous matters and essential oils, which, when combined together, will not only possess the properties of quick ignition, and mechanically connecting the aforesaid matters, but of doing so without rendering such matters liable to crumble or fall apart during transportation."

Claim.—"What I claim, is the combination and use of the spirits of turpentine with the charcoal and other materials named, for the purpose of so softening the resinous materials of the composition as to enable them to adhere with tenacity after compression, and thereby to sustain the shocks incident to transportation without fracture."

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46. For an *Improved Method of Attaching the Arch to the Truss Frame in Bridges;* J. D. Steele, Pottstown, Montgomery county, Pennsylvania, February 20.

The patentee says,—"My invention consists not simply in combining one arch or arches with a truss frame, as this has long been known, but in effecting this combination by securing the arch or arches to the posts alone, when the posts are so connected with the chords as to admit of changing the position of the arch or arches relatively to the chords, and of drawing together the chords to camber the truss, without changing the position of the arch or arches, whereby I am enabled to camber the truss and to regulate and distribute the weight and strain equally at pleasure."

Claim.—"What I claim as my invention, is combining the arch or arches with the truss frame, by attaching it or them to the posts above, (in contra-distinction to the diagonal braces,) when the said posts are so connected with the chords as to admit of drawing them together without changing the position of the arch or arches, and of changing (by the same means) the position of the arch or arches relatively to the chords."

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47. For an *Improvement in Brick Presses;* Valentine Roth, Evansville, Vanderburg county, Indiana, February 20.

Claim.—"What I claim as my invention, is, 1st, the combination and arrangement of the two horizontal circular revolving mould plates, for moulding the brick, with the tub, revolving shafts, and pressers, and conveying the brick to the discharging pistons simultaneously in opposite directions, the gearing being so arranged as to cause the rotating mould plates and reciprocating pistons to have the motions and pauses as herein set forth, for moulding and discharging the brick."

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48. For an *Improvement in Short Slide Valves for Chamfering the Corners;* Jas. Mulbury, Parkesburg, Chester county, Pennsylvania, February 20.

The patentee says,—"My improvement consists in making the sides of the steam ways in the seat of the valve, and the sides of the steam way in the valve or slide, join their respective faces by rounded or flattened corners; also the joining of the outer sides of the seat, and that of the outer sides of the slide, with their respective faces by rounded corners."

Claim.—"What I claim, is the rounding or flattening of the corners joining the sides of the steam ways in, and the outer sides of the seat of the valve with, its face. Also the face of the valve or slide being joined to the sides of the steam cavity therein, and to its outer sides, by corners rounded or flattened as set forth."

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49. For an *Improvement in Self-Acting Registers for Stoves;* Lathrop S. Bacon, Le Roy, Genessee county, New York, assignee of W. Race, Seneca Falls, Seneca county, New York, February 20.

Claim.—"What I claim as my invention, is the arranging and combining the respective parts of my improved stove registering apparatus with each other, and with a stove, in such a manner that the expansion and contraction of the stove itself, (or the portion of it with which the registering apparatus is combined,) shall operate the register or damper plate, and thereby regulate and govern the admission of air to the chamber of combustion."

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50. For a *Fluid Metre;* William Henry Lindsay, City of New York, February 20.

The patentee says,—"The object sought by the use of the fluid metre is the direct measurement, and registration by means of a counter, of the quantity of fluid which has passed from one or more vessels into, and been discharged from, a cylinder of any given diameter and length."

Claim.—"What I claim as my invention, is, 1st, the described machine or mechanical combination, for the measuring or ascertaining the cubical or other quantity of a fluid that may pass, or be forced by mechanical or other means, through it, with the self-registration of the same by means of a counter or other suitable contrivance.

"2d, The making or leaving a sufficiency of space above or beyond the port leading into the chamber in the cylinder, to allow the piston to pass above or beyond the port, or any portion of it, with the object or intent of providing an escape for the fluid forced into the cylinder from the feed pump, in case of the metre failing to act, from an accident by breaking of the rods, or from other causes.

"3d, The use of the pneumatic pump or pumps, or springs, whether of metal or other material, for the purpose of assisting the return of the piston during the exhaust or upward stroke of the feed pump plunger."

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51. For an *Improvement in Machinery for Turning Right and Left Lasts, &c., from the same pattern;* Samuel Huntington, Middlefield, Otsego county, New York, February 20.

The patentee says,—"The nature of my invention consists in the construction of a machine for turning irregular shapes."

Claim.—"What I claim as my invention, is the arrangement and combination of the vibrating beam and cutter wheels with the revolving centres, so as to produce at one time, and from one pattern, a right and left last, or a series of right and left lasts, or work of like character."

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52. For an *Improvement in Apparatus for Current Wheels;* James Secor, St. Louis, Missouri, February 20.

The patentee says,—"The nature of my invention consists in forming on a disk a reaction wheel, with buckets attached by their inner extremities to the disk. The radius of curvature of the buckets increases towards their outer extremities, but their general position is such, that a straight line, drawn from the outer to the inner extremity of a bucket, is nearly at right angles to the radius from the centre of the axle to the inner point of the bucket. At the inner extremities of the buckets, and on the side opposite to the disk, is a flat ring to which they are connected, and beyond the outer periphery of which they project to the same distance as they do beyond that of the disk."

Claim.—"What I claim as my invention, is the manner of regulating the action of my reaction current wheel, by combining it with a wicker gate, of which the opening is regulated, held stationary, or inverted, with an inversion of current.

"I also claim the combination of vertical wings, having inclined flanches, passing under the floor of the channel leading to my mill, with the reversable wicker gate above described.

"I also claim the combination of machinery by which I hold stationary the wheels of the governing apparatus of my wicker gate, not confining myself to the exact arrangements of the parts set forth."

53. For an *Improvement in Churns;* Charles Murdock, Baltimore, Maryland, February 20.

The patentee says,—"The nature of my invention consists in combining with the ordinary dash churn, a hollow perforated cylindrical dash, secured to the lower end of the common dash-staff, which staff is perforated in the centre vertically, to permit it to move up and down over a central vertical stationary guide-spindle, fixed permanently in the centre of a stationary cylindrical block, of less diameter than the hollow cylindrical dash which moves over it in its descent and ascent, the motion of the dash-staff being similar to that of the common churn, but the effect being to fill the hollow cylindrical dash, at each ascending movement, with air admitted through the head of the churn tub, and to convey said air down through the cream or milk, until it is met by the central stationary block, when it is compressed in the cylinder, and forced radially through the apertures in the cylindrical dash into the cream."

Claim.—"What I claim as my invention, is the combination of the hollow cylindrical dash, perforated around its periphery near its lower or open end with a number of small apertures for the air to pass through, and the central guide-spindle and stationary cylindrical central block, over which the cylindrical dash works, with the ordinary upright tub churn."

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54. For *Improvements in Machinery for Turning Irregular Forms;* John Kimball, assignee of Jas. M. Eddy, Boston, Massachusetts, February 20.

Claim.—"I claim the manner in which I construct and operate the cutters of my machine. I also claim the vibrating frame, its shaft, pulleys, and bolts, in combination with the driving shaft and its driving pulley, the cutter carriage and its drums or pulleys; the whole being made to operate together in manner and for the purpose of imparting to the cutters a continual revolving power, during the reciprocating rectilinear movements of the cutter carriage. And I claim also, in combination with the mechanism for cutting or reducing the wood or block, the mechanism by which said wood or each block and the pattern are partially and simultaneously rotated at regular intervals of time, for the purpose of bringing the cutters to act on a fresh surface or surfaces of the wood or block; the said mechanism consisting of the gear wheels on the pattern and block mandrils, the worm gears or screws, the shaft, the pulley c', and spring pawl, the ratchet wheel, the weighted cord, lever, stop, and projections from the pulley, &c."

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55. For *Improvements in Carding Engines;* Jeptha Dyson, Fulton, Sumpter district, South Carolina, February 20.

The patentee says,—"The principle of the above improvement consists in the employment of two cylinders, surrounded or clothed with teeth of metal in the form of wire, or other form adapted to the end in view, mounted with proper journals, on suitable bearings, below the main cylinder of the carding engine, at any convenient point, between the feeder or licker and the doffer cylinder, and driven by the main or other shafts of the carding engine, and so adjusted as to operate on the surface of the main cylinder, and upon the surface of each other, and to strip and clear the main cylinder to the extent required, and return the strippings to the main cylinder to be carded over and delivered to the doffer cylinder; it being a leading principle in the said improvement to adjust the number or quantity of teeth in the stripping or clearing cylinder, in such a way as to cause it to remove the strippings in such limited quantities, in each revolution of the main cylinder, as will always enable the latter to deliver a sufficient amount of the carded material to the doffer cylinder, and with due regularity."

Claim.—"What I claim as my invention, is the cylinder A, surrounded or clothed with a spiral fillet of metal teeth in form of wire, or with teeth of metal of the form and description mentioned and described on the 4th specification, as arranged and employed in the 3d and 4th specifications, in combination with the main cylinder C, and with the cylinder B, or with the main cylinder only, to strip and clear the latter by a self-acting contrivance, whilst the carding engine is in operation.

"I also claim the cylinder B, in combination with the cylinder A, and the main cylinder C, as applied to receive the strippings from the former, and to deliver them to the latter."

56. For an *Improved Cartridge Tube and Conveyor, forming a fire-arm;* Christian W. Büchel, City of New York, February 20.

The patentee says,—"The nature of my invention, consists in constructing fire-arms with a chamber for containing the ammunition, in such a form as to be readily transferred to the barrel of the gun by apparatus prepared for that purpose, by means of which the gun can be discharged many times in rapid succession, the whole being combined in a neat and portable form."

Claim.—"What I claim as new, is, 1st, the cartridge tube, constructed in the manner and for the purpose set forth. I also claim the tube for conducting the cartridges into the barrel.

"2d, I claim the follower for forcing forward the cartridges in the cartridge tube, in combination with said tube."

57. For an *Improvement in Cooking Stoves;* James L. Norton, Perry township, Jefferson county, Pennsylvania, February 27.

The patentee says,—"The nature of my improvement consists in constructing the double bottom of the oven so as to make the inclined back to the front flue of the fire place like a Franklin stove, and admitting cold air at the lower angle thereof, which ascends through the oven, and is carried off through a hole in the top of the oven, either into a pipe, when required for heating apartments, or into the flue, when cooking in the oven."

Claim.—"What I claim as new, is, 1st, the combination of the air chamber below the oven, and the movable pipe for conveying off the hot air. And lastly, I claim, in combination with the double flues, the projection rising above the back flue before it contracts into the size of the pipe."

58. For an *Improvement in Flood Fences;* Henry Reichert, Shippensburg, Cumberland county, Pennsylvania, February 27.

Claim.—"What I claim as my invention, is the combination of the hinged falling posts with buoyant notched levers, for letting down the panels, by the rising of the water acting on said buoyant levers.

"I also claim the combination of the spring with the panel, for holding the panel when thrown down by the flood, to prevent its being raised by the rising of the water, as described."

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59. For an *Improved Detached Metallic Cartridge Tube, &c., for Fire Arms;* David Minesinger, Beaver, Beaver county, Pennsylvania, February 27.

The patentee says,—"The nature of my invention consists in making the external surface of my metallic cartridge tube of the form of the frustrum of a cone, and the internal surface cylindrical, which causes the muzzle to be thinner than the breech, so that when the piece is discharged, the heat from the explosion of the charge will expand the muzzle instantaneously on account of its thinness, and cause it to close the joint between the metallic cartridge tube, and the chamber of the gun barrel into which it is inserted, and thus prevent any part of the explosion escaping at the breech except that which issues from the vent, and also preventing the same degree of recoil as in the use of the cylindrical metallic cartridge chamber, the points of friction being in annular circles from the muzzle of the tube to the breech against the interior surface of the chamber of the gun into which the cartridge is inserted, which chamber is made of corresponding shape and size to that of the external surface of the cartridge tube. Also in making the bore of the metallic cartridge tube, next the breech, the shape of a parabola. Likewise in giving the vent an angular direction, from the nipple to the centre of the parabolic end of the chamber for the charge. Also in the employment of a hinged holder, for holding the metallic cartridge tube firmly in the chamber of the gun barrel, with the muzzle close against the shoulder formed in the chamber of the barrel, and preventing any recoil of the cartridge tube at the discharge of the piece; the hinges by which it is connected to the barrel allowing of its easy and ready insertion and removal during the operation of changing the tube in firing the gun in quick succession, being in the most convenient position on the gun, and always in operation."

Claim.—"What I claim as my invention, is, 1st, the hinged holder and cap, in combination with the frustrum of a cone metallic cartridge tube."

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60. For an *Improved Machine for Dressing Nuts and Bolt Heads;* Julius King, Bordentown, Burlington county, New Jersey, February 27.

Claim.—"What I claim as new, is the combination of the twin cutters with the sleeves, or other equivalent device for gauging their distance apart, and with the mandril upon which they are mounted, whereby the sides of nuts and bolt heads are finished in less time, and with a machine of less size and cost, than where only one cutter is used."

61. For an *Improvement in Presses;* David M'Comb, Port Gibson, Claiborne county, Mississippi, February 27.

Claim.—"What I claim as my invention, is, 1st, the combination of the pulley, rope, and central vertical shaft, by which the power is applied beneath the centre of the follower, in such a manner that the rope, in winding on the shaft, will not ride or touch the adjacent coils, and consequently will not be liable to wear, rub, or chafe, said rope being, in a single length, conveyed through an opening in the shaft, and attached by its extremities to the connecting pins of the two toggles; the pulleys around which the rope is passed being arranged in pairs on the horizontal joint, or connecting pins of the toggles, outside the same, by which arrangement their diameter can be increased or diminished at pleasure; and the shaft being of the diameter of the width apart of the pulleys, so that the rope shall be drawn in straight parallel lines as described, to prevent rubbing against the flanches of the pulleys.

"2d, I also claim the combination and arrangement of the hinged shutters with the followers for shutting the bagging and ropes into corresponding depressions in the sides of the same, so as to prevent them from getting out of place whilst the follower is descending, as before described, preventing entanglements and derangement of the ropes and ends of the bagging in lowering the follower into the box.

"3d, I likewise claim making the drag in the form of a segment of a circle, with a joint and key, arranged and operated in the manner and for the purpose described and set forth.

"4th, I also claim inclining the four hanging posts of the frame inward, by which the shoes of the toggles are sustained perpendicularly under the outer ends of the follower, whilst the required length and width of the cotton box is obtained."

62. For a *Protector Slide for Door Locks;* George F. J. Colburn, Newark, Essex county, New Jersey, February 27.

The patentee says,—"The nature of my invention consists in attaching to the cap of the ordinary rim lock a movable slide of brass or iron, having an oblong aperture in the middle, made to clasp the spindle, the end of the slide being widened on the lower side to cover the keyhole, and notched in square on the end to clasp the pin of the key, the slide being shoved in, the spindle, key, and keyhole are locked, defying the burglar from without."

Claim.—"What I claim as my invention, is the application to the ordinary rim lock of a metal slide, which will at the same time cover the keyhole, protecting the lock from being picked or opened from the outside; prevent the key from being turned by the application of instruments to the pin, or its dropping out by the slamming of the door, and retain the knob spindle in a fixed position, rendering it inoperative on the latch, thereby converting the latch into an additional bolt."

63. For an *Improvement in Weavers' Temples;* Lewis K. Day and Preston Day, Sacarappa, Cumberland county, Maine, February 27.

Claim.—"We claim as our invention, the combination and arrangement of the following parts, viz., 1st, the jaws; 2d, the arm B and its joint pin; 3d, the lever; 4th, the spring; 5th, the tablet or support piece; 6th, the arm I, with its spring and stud; the whole being constructed and applied together as described, and so as to operate essentially as specified."

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64. For an *Improvement in Jaw Temples for Looms;* Geo. Draper, Ware, Hampshire county, Massachusetts, February 27.

Claim.—"What I claim as my invention, is the cam *i*, and lever, (applied to the breast beam,) in combination with the inclined plane or cam *e*, projection *k*, or any mechanical equivalent therefor, as connected with the lay, the whole being applied to the temple, and made to operate as specified."

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65. For an *Improvement in Gas Apparatus;* Amaria Pierce, Philadelphia, Pennsylvania, February 27.

Claim.—"What I claim as my invention, is, 1st, the ribs or flanches around the retort; 2d, the passing of the lower end of the retort through the fire grate, so as to connect it directly with the condenser; and 3d, the immersing of the lower end of the retort in water or other suitable fluid; all of which being constructed, arranged, and operating in the manner and for the purpose described."

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66. For an *Improved Metallic Packing for Pistons;* William Wright, Providence, Rhode Island, February 27.

The patentee says,—"My invention consists in making elastic metallic packing for the pistons of steam engines of two cut rings, one within the other, and each made of a gradually reduced thickness towards the ends, so that, when inserted one within the other, the outer and the inner peripheries of the compound ring shall be concentric, whilst the line of separation between the two shall be eccentric, when this is combined with a projecting pin which lies in the space between the ends of the inner ring, to retain the thickest part of one ring always opposite the open and thinnest part of the other."

Claim.—"What I claim as my invention, is the making of metallic packing for the pistons of steam engines of two cut rings, one within the other, the outer and the inner peripheries of the compound ring being concentric, and the division between them eccentric, substantially as described; when this is combined with the mode of keeping the two rings with their thickest parts on opposite sides of the common centre, by the projecting pin attached to the outer ring, and the plate embraced by the ends of the outer ring, to cut off the passage of the steam, as described."

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67. For an *Improvement in the Manufacture of Hubs and Axles;* Stephen R. Hunter and Mead Merrill, Cortlandtville, Cortlandt county, New York, February 27.

The patentees say,—"The first part of our invention relates to the construction of carriage wheels of wrought iron, and steel, and cast iron, and consists in making the inside and outside of the hub of sheet iron or steel, with a sheet metal washer at each end, and the spokes, which are made of thin steel or other metal, riveted or otherwise secured to the rim of the wheel, and let into the outer case of the hub, and formed with a mortise or indentation, where this is combined with the method of firmly securing the whole, by running cast iron into, and filling up the space within, the hub. And the second part of our invention relates to the construction of the axles of carriages, and consists in making the arm of the axle of sheet iron, bent to the required form, and secured into a steel or wrought iron axle by running cast iron into the space between."

Claim.—"What we claim as our invention, is the method, substantially as herein described, of making the hubs of carriage wheels, by forming the inner box and outer case or surface of sheet metal, and uniting them by filling the inner with cast iron, by running the molten iron in between them, as described; and, in combination with this method of forming the hub, we also claim the method of securing the spokes, by inserting their inner ends in the outer case of the hub, that the cast iron within the hub may run around and secure them in place, as described.

"And we also claim the method of forming the axles of carriages, by making the outer form of the arm of the axle of sheet iron, when this is united to the steel or wrought iron axle within by means of iron cast in the space between the two, as described."

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68. For an *Improvement in Machinery for Separating Flour from Bran;* Issachar Frost and James Monroe, Albion, Calhoun county, Michigan, February 27.

Claim.—"We claim to be the original and first inventors of the combination and arrangement of the external upright stationary close cylindrical case, with the internal combined punched and reticulated upright stationary scourer and bolt, and revolving cylindrical scourer and blower, constructed, arranged, and operated in the manner and for the purpose herein fully set forth, by which the fine flour that usually adheres to the bran, after being subjected to the first bolting operation, is now completely separated from the bran and collected in the annular space between the cylindrical bolt and cylindrical case, from whence it descends through the segmental openings in the horizontal base upon which the said bolt and case rest, into conducting spouts, as aforesaid; whilst the bran is blown from the interior of the bolt through a spout leading through the external case, as aforesaid; the meshes of the bolting cloth being kept open by the pressure of air produced inside the combined cylindrical scourer and bolt, by the manner in which the oblique, and radial, and parallel wings are arranged on the revolving scouring and blowing cylinder, as set forth."

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69. For an *Improvement in Suspending Telegraph Wires;* Elijah Pratt and Raymond Graverend, City of New York, February 27.

The patentees say,—"The nature of our invention consists in suspending a stretched gum elastic band, cord, or tube, on posts or other suitable permanent fixtures, on or through which a wire is suspended through the air for distances of great length, for the passage of telegraph wires across rivers, and in other similar situations."

Claim.—"What we claim as new, is suspending telegraphic wires across rivers, by means of a stretched gum elastic band or tube, in the manner and for the purpose set forth."

70. For *Improvements in Brakes for Cars;* William Stinehart and John Taggart, Charlestown, Middlesex county, Massachusetts, February 27.

Claim.—"What we claim as our invention, is the stationary support plate, (composed of one plate or two plates,) the hinged flap, and the confining bolts, (or other mechanical equivalents,) in combination together, and as applied to the brake lever, and made to sustain the rubbing piece of wood, in the manner and for the purpose as specified."

71. For an *Improvement in Horse Rakes;* Calvin Delano, East Livermore, Kennebec county, Maine, February 27.

Claim.—"What I claim as my invention, is so making horse rakes, by hanging the head or heads on one common rod or pivot, as to allow each tooth to have a separate and independent movement, to enable the rake to pass over small as well as large obstructions, without disturbing the action of any of the contiguous teeth beyond the obstructing body."

RE-ISSUE.

1. For an *Improvement in Bee Hives;* Abraham Sanburn, Sycamore township, Hamilton county, Ohio; patented March 26, 1845, re-issued February 13, 1849.

The patentee says,—"The nature of my invention consists in providing an artificial harbor or place of refuge for the bee-moth or miller, so arranged and located that she will invariably seek and secrete herself in the same, whether attacked or not attacked by the bee.

"Another part of my invention consists in baiting this place of refuge with bee-grubs, bee-bread, honey, or comb, for the purpose of reducing to a certainty the advent of the moth thereto, as her instincts tell her that she will there most readily find and reach a refuge for herself, and food for her progeny.

"Another part of my invention consists in suspending the floor from the hive, by means of wire hooks and staples, or other equivalent devices, at a suitable distance (say $\frac{3}{8}$ths of an inch) from the bottom of the sides of the hive, so that the bees and the bee-moth or miller can have uninterrupted ingress and egress, (the bees to the hive, and the miller to the harbor,) and also for the purpose of ventilating the hive sufficiently and at all seasons."

Claim.—"What I claim as new, is providing a harbor or place of refuge for the bee-moth or miller, which admits of her free ingress and egress thereto, to secrete herself and lay her eggs undisturbed by the bees, the entrance to the trap not being of sufficient size to admit the passage of the bee. I also claim as original, the combination of the moth-trap or harbor, before described, with the suspended hive, constructed and arranged in the manner set forth."

MECHANICS, PHYSICS, AND CHEMISTRY.

Lectures on Static or Franklinic Electricity, delivered before the Royal Institution. *By* PROF. FARADAY.*

The annual course of lectures, by Professor Faraday, commenced this day, (April 21,) the subject being "Static or Franklinic Electricity." In his commencing observations, the Professor alluded to the difficulty he experienced in varying the subjects of his annual lectures, and said that he should, in the present course, return to the subject of frictional electricity, and begin with the simplest modes by which it is excited.

Taking a piece of amber, and rubbing it on his coat sleeve, he then brought it near to a suspended magnetic needle, with a gilt ball at each end. The attraction to the needle to the amber showed that the friction had, in some measure, imparted to it a power which it had not before possessed, though the amber had not apparently undergone any change. It was to the consideration of this power, and to its extraordinary effects, that the attention of his audience would be directed, for in whatever manner it might be excited, and how various soever the degrees in which it was manifested, the electricity produced by rubbing the amber was the same power, and was capable of being accumulated into a destructive force.

The Professor exhibited several modes by which electricity may be excited, and the effects of its attraction on various bodies. The following are some of the experiments, which may be readily repeated by any one. A glass rod rubbed with a piece of dry silk, on which an amalgam of tin, quicksilver, and zinc had been spread, was brought near two eggs, which then rolled about the table as if they had been animated. Some sulphur was then pounded in a mortar, and scattered on the plate of a gold leaf electrometer, the leaves of which instantly diverged—thus proving that electricity had been excited by the friction of the particles in falling. The grinding of coffee produced a strong development of electricity as it fell from the coffee-mill. Every sort of body admitted of the excitation of this mysterious force, but none more readily than gutta percha.

Most of the electrics, or those bodies which are most readily excited, are combustible substances, such as resin, shellac, sulphur, and gutta percha; and it might have been inferred from this fact, that the carbon and hydrogen which enter largely into the constitution of combustible bodies, were essential to the excitement of electricity; but this inference would be found very erroneous.

Gun cotton and gutta percha were adduced as substances varying essentially in their chemical composition, and yet were two of the most easily excited electrics. The quantity of carbon, or charcoal, in gun cotton is so great, that even when burnt in oxygen gas, to effect its combustion in the most perfect manner, a great quantity of smoke and soot is evolved; whereas the explosive portion of gun cotton contains so large a quantity of oxygen that it explodes without any smoke.

The consideration of the accumulation of frictional electricity was illustrated by several experiments, the most remarkable of which was the setting fire to a jet of gas with the electricity excited on a sheet of paper. The paper, after having been warmed, was rubbed briskly with India-rubber, and then applied to a disk of metal mounted on a glass rod. The metal surface served to conduct and concentrate the electricity spread over the paper, so that a spark was emitted when the brass pipe of the gasometer was brought near it, and the issuing gas was inflamed. In the dark, flashes of light may be seen when dry paper is rubbed with clean India-rubber. The accumulation of electricity by the electrical machine was referred to, and one of the earliest forms of an electrical machine was exhibited. It consisted simply of a glass globe with a neck, which was mounted on a stand with a handle to turn it, and without any conductor.

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* From the London Mining Journal, Nos. 714, 717, 718, 719.

Having shown the accumulating power of the large electrical machine belonging to the Institution, the Professor next exhibited the excitement of electricity by other means than friction, as by heated tourmaline, by melted sulphur, and the evaporation of water. He cóncluded with some general observations on the mysterious nature of electrical force and its alliance to the other powers in nature, expressing his firm belief that all the properties of matter and the actuating principle of organic and of inorganic bodies depends on electricity.

Second Lecture.—Mr. Faraday said he should, in the present lecture, confine himself to the consideration of the nature of electrical force, which, in the preceding one, he had shown the various means of exciting. The opinions of early electricians respecting the nature of the forces excited by the friction of electrics were stated, for the purpose of showing the impressions which such strange phenomena were calculated to produce when first known, and also as a caution against mingling theory with fact in the statement of any observed effects.

One of the most remarkable characteristics of electrical force is its power of attraction and repulsion; which two opposite forces are always found together, like cause and effect, and may be inverted; so that the electric which at one moment attracts will in the next moment repel. Several experiments illustrative of the repulsive power of electricity were exhibited, the most curious of which was the repulsion of a small balloon inflated with common air; the repelling power imparting to it an apparently ascending force, which raised it in the air. The two forces of attaction and repulsion seem, Mr. Faraday observed, to arise from the presence of two kinds of electricity, and in the early stages of the science the apparent existence of two kinds of electricity became known, one of which, being excited by glass, was called vitreous, and the other, being excited by resin, was called resinous electricity.

Mr. Faraday cautiously guarded himself from affirming positively that there are two kinds of electricity, but he said that there appeared to be two different electrical conditions, and he should, therefore, adopt the usual phraseology in speaking of electricity as consisting of two kinds. To show the distinction between vitreous and resinous electricity, a small gilded balloon was suspended, to which electricity was imparted, first by an excited glass rod, and afterwards by a rod of shellac. The effects of attraction and repulsion were the same in each case separately, but when the balloon was repelled by the glass it was attracted by the shellac; when the latter repelled it the glass attracted; and when the glass rod and the shellac together were brought near the balloon, the opposite electricities neutralized each other, and no effect whatever was produced. These experiments proved that what one kind of electricity can do, the other kind can do, but that when they are both united their forces are destroyed.

Though appearances thus show that there are two kinds of electrical force, there is no evidence of the existence of a third kind, for notwithstanding the varieties of substances by which electricity can be excited, the electricity is in every case either vitreous or resinous, and no other. It is one of the laws of electrical action, that bodies similarly electrified repel each other; and it is on the application of this property that the action of electrometers depend, the gold leaves or the pith balls diverging in consequence of each one being charged with electricity of the same kind.

An easily constructed and rather sensitive electroscope was put together by Mr. Faraday. It consisted of a watch glass laid on the table, with its convex surface uppermost; on this was placed a small piece of flat glass, and upon the flat surface was balanced a thin lath, which was very easily attracted or repelled by an excited electric.

The facility with which electricity may be transferred from one body to another was shown by means of a small metal ball suspended by a silk cord, which, when applied to an electrified metal globe, became instantly charged with the same kind of electricity.

The induction of different kinds of electricity in a metal globe divided in two was also exhibited. Each half was mounted on a glass insulating stand, and after being placed together an excited glass rod was held near to one of the hemispheres. ·Whilst the electric continued to be held near, the other hemisphere was removed; and when the electrical condition of the two was examined, one was found to be charged with positive or vitreous electricity, and the other with negative or resinous electricity.

Mr. Faraday concluded by directing attention to the distinction between the transfer of electricity and the conduction of heat; for in the case of electricity the whole of it may be removed, so as to leave the body in an absolute state of zero, whilst the conduction of heat only lowers the temperature, and it is impossible, by any known means, to abstract the heat entirely.

The *Third Lecture* by Mr. Faraday on Static Electricity, was principally devoted to the consideration of the transference of electricity from one body to another. He introduced the subject, however, with some further examples of the existence of two kinds of electricity, observing that the chief characteristic of electrical force is its duality; and that no power is manifested until the two kinds of electricity are separated. In illustration of this fact, a rod of shellac, to which a flannel cap was fitted, was excited by twisting it round a few times; but no manifestation of the presence of electricity was afforded by the most sensitive electrometer until the flannel was separated from the shellac, when each exhibited strong evidence of being highly excited, and with electricity of opposite kinds. The properties which some bodies possess of conducting electricity much more readily than others is so important, that were it not for the imperfect manner in which some substances conduct, no such power as electricity would be known; for as soon as it was excited it would be conducted away. The difference between electrics and non-electrics seems to depend on their differing conducting powers; for a rod of brass, which exhibits no electrical property whatever, when held on the hand and rubbed becomes highly electrical when mounted on shellac, which, being a bad conductor, prevents the electricity from passing off to the earth, as it does when the brass is held in the hand.

Mr. Faraday observed that there are no absolute non-conductors of electricity, for all bodies conduct, though the degrees of their conducting power are almost infinitely varied. Even the metals vary very materially in their conducting powers, and in this respect there is some analogy between the conduction of heat and the conduction of electricity.

Two similar rods, one of iron the other of copper, were heated by the application of a spirit lamp to one of their ends, and a number of balls were stuck to the rods with cerate at different distances, so that as each rod became heated the cerate melted, and the balls fell in succession. The rod of copper conducted the heat so much quicker than the iron, that all the balls from it had fallen off when half of those on the iron remained.

Several experiments were performed for the purpose of illustrating the differing degrees of conductibility of different substances, and to show that a bad conductor may, by increase of quantity, draw off as much electricity as a good conductor when of small size. When a thin lath was reared against the prime conductor of the electrical machine, so as to communicate with the earth, but a small portion of the electricity was drawn off by it, as was shown by the length of the spark; but when a thicker piece of wood was substituted the length of the spark was greatly diminished.

The superior conducting power of water, compared with silk, was shown by connecting two insulated pieces of metal with a silk string, under which circumstances no appreciable amount of electricity was transferred from one to the other; but when the string was wetted with water the electricity passed freely. The best of conductors, however, offer considerable resistance to the passage of electricity; and in discharging a Leyden jar through about 40 feet of thin copper wire, it was shown that the electricity preferred passage through a small space of air, through a non-conductor, to traversing the whole length of the wire.

The effect of carpets in obstructing the passage of electricity was shown in a curious manner. Mr. Faraday, when standing on a carpet, and being in connexion with the prime conductor of the electrical machine, set fire to a jet of gas by bringing his finger near it, the carpet acting in that case in the same manner as an insulating stool.

A facile mode of constructing an insulating stool of the most effective kind was shown, for the advantage of those who have no regular apparatus. Four glass tumblers inverted, with a piece of gutta percha on each, and with a quarto volume for a top, serve all the purposes of an insulated stool; and, as gutta percha is a very bad conductor, such a stand is a more effective insulator than an ordinary glass stool.

The transferrence of electricity by convection is distinct (Mr. Faraday remarked) from the ordinary conduction of electricity, as in the former case the electricity is transferred by being carried from one body to another. Several instances of this kind of transferrence of the power was shown, the emission of electricity from points being the most curious. When a metal point is attached to the prime conductor, scarcely any signs of electricity can be obtained from it, as the point carries it off. A visible representation of this mode of transference was afforded by putting melted sealing wax on a metal point, when the convective force carried the wax against a sheet of paper in the most delicately minute fibres, finer than those of a spider's web.

In the next lecture, it was announced, the phenomena of induction will be considered.

Fourth Lecture.—The curicus property and phenomena of induced electricity formed the principal subject of the discourse, which was illustrated with a great variety of well-contrived and curious experiments.

In the first place, he exhibited the simple phenomenon of induction, by showing the action of an excited glass rod at a distance from the electrometer, and its power of communicating electricity to an insulated brass cylinder without touching it, and by that means setting fire to gas. The induction of electricity in these instances takes place through the air, which is a non-conductor, and the power increases when more perfect and solid non-conductors are used, as was exhibited by interposing a great thickness of sulphur and shellac between the electric fluid and the electrometer. The more perfect insulators transmit induced electricity with greater facility than imperfect ones; and it has been ascertained that sulphur is $2\frac{1}{4}$ and shellac $2\frac{1}{2}$ more effective than air in transmitting induced electricity. The power which one electrified body possesses in inducing electricity in all other bodies has no known limit, and may be supposed to extend through infinite space, though the intensity diminishes in a greater ratio than the distance.

As an illustration of the extended influence of induction, a large metal globe was suspended at a considerable height in the lecture room, and having been charged with electricity, the extent of its influence was shown by collecting electricity, by holding a small piece of insulated gold paper towards it, by which means sufficient electricity was collected to diverge the leaves of the electrometer. The charged metal globe, Mr. Faraday said, might be considered as a small thunder cloud; and in a subsequent lecture, when treating of atmospherical electricity, he should have to remark on the important effects of induction on the large scale.

A very remarkable characteristic of static electricity is, that one kind of electricity cannot be excited without the other kind, and this is peculiarly manifest in electrical induction. When an excited glass rod is held near to any body, the glass, being positively electrified, induces negative electricity in that part of the body nearest to it, and positive electricity in the part most remote. If the body be insulated, and the positive electricity be drawn off by a momentary connexion with the earth, it is left in a negative state when the glass rod is withdrawn.

For the purpose of showing that, when electricity is induced in metals, they convey it along their surfaces only, and that the inside of a metallic vessel contains no electricity, an ice pail was electrified, and though the outside gave abundant evidence of electricity, a metal ball lowered inside to the bottom did not effect the electrometer. A white mouse was enclosed in a wire gauze cage, and being placed on an insulated stand, and connected with the electrical machine, very powerful sparks were taken from all parts of the gauze without disturbing the mouse, which seemed quite unconscious of the miniature lightning storm around it. As a further illustration of this curious property, several brass pillars were arranged in a circular form on an insulated metal stand, and though there was the space of half-an-inch between each pillar, the interior of the skeleton cylinder gave no trace of electricity, which was emitted in strong sparks from the outside of the rods.

Induction affords an explanation of the apparent repulsion of bodies similarly electrified. Some strips of paper, on being held together at one end, started far apart when in connexion with the prime conductor of the machine, as if repulsive power acted on each strip, and when both ends were fastened, the strips distended in the middle like a balloon. This apparent repulsion was, however, shown to be entirely due to the attractive power induced in surrounding bodies, for when the balloon was partially inclosed by the hands, the stronger attraction caused by increased proximity, caused it to distend with much greater energy.

As electricity is induced through the intervening substance of a non-conductor, the inside of a vessel made of shellac or glass will contain electricity as well as the outer surface, in which respect non-conductors differ essentially from metallic substances.

The same principle on which Mr. Faraday explained the cause of metallic vessels not containing electricity, he also applied to explain the cause of electricity being much more readily emitted from angles and small balls than from large balls and flat surfaces; but this part of the subject was hurried at the conclusion, and was not made so clear as Mr. Faraday's illustrations generally are.

To be Continued.

*A New Analogy in the Periods of Rotation of the Primary Planets.**

Mr. Sears C. Walker addressed the Association on the subject of a new analogy in the periods of rotation of the primary planets, discovered by Daniel Kirkwood, Esq., of Pottsville, Pennsylvania.

Gentlemen:—The subject of my present communication is contained in a letter of Mr. Daniel Kirkwood, of Pottsville, Pennsylvania, dated July 4th, of this year.

The Secretary then read Mr. Kirkwood's letter, as follows:—

Pottsville, Pa., July 4th, 1849.

Sears C. Walker, Esq.,

Dear Sir:—Knowing the great interest you feel in astronomical inquiries, I take the liberty of submitting the following paper to your consideration, and respectfully soliciting your opinion as to the problem which I have been attempting to solve. Is it, or is it not, deserving of further investigation? Whatever may be your decision, as I have the fullest confidence in your judgment, I shall at once acquiesce. Wishing to be as brief as possible, I will not trouble you at present with any statement of the considerations which suggested my hypothesis.

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*Proceedings of the American Association for the Advancement of Science. Second Meeting. Held at Cambridge, Mass., August, 1849. From the Boston Evening Traveler, Sept. 7.

While we have, in the law of Kepler, a bond of mutual relationship between the planets, as regards their revolutions round the sun, it is remarkabie that no law regulating their rotations on their axes has ever been discovered. For several years I have had little doubt of the existence of such a law in nature, and have been engaged, as circumstances would permit, in attempting its development. I have at length arrived at results, which, if they do not justify me in announcing the solution of this important and interesting problem, must at least be regarded as astonishing coincidences.

Let P be the point of equal attraction between any planet and the one next interior, the two being in conjunction; P′, that between the same and the one next exterior.

Let also D = the sum of the distances of the points P, P′, from the orbit of the planet; which I shall call the diameter of the sphere of the planet's attraction;

D′ = the diameter of any other planet's sphere of attraction found in like manner;

n = the number of sideral rotations performed by the former during one sideral revolution round the sun;

n' = the number performed by the latter; then it will be found that

$$n^2 : n'^2 :: D^3 : D'^3;\ \text{or}\ n = n' \left(\frac{D}{D'}\right)^{\frac{3}{2}}$$

For the sake of convenient reference, I subjoin the following tables.—The masses of Venus, the Earth, Mars, Jupiter, and Saturn, are taken from your edition (1845) of Sir John Herschell's Treatise on Astronomy. Those of Mercury and Uranus correspond with my hypothesis, and are nearly identical with the most recent and reliable determinations of astronomers. In other words, the mass of Mercury is very nearly a medium between the two estimates of Encke,* while that of Uranus is more than $\frac{17}{18}$ths of Struve's mass, $\frac{1}{26800}$ found by observations on the satelites.† The mean distances not being given in miles in Herschell's Treatise, I have used the table of distances in the Astronomy of Prof. Norton. For Mars' period of rotation (24*l.* 37*m.* 20·6*s.*) I have adopted the recent determination of Prof. O. M. Mitchell. (Sid. Mess. Vol. I. p. 52.)

TABLE I.

Planet's name.	Mean dis. from the Sun in miles.	Mass.	Square root of mass.	No. rotations in one Sid. Period.	Logarithm.
Mercury,	36,814,000	277,000	526·3	87·63	1·942653
Venus,	68,787,000	2,463,836	1569·6	230·90	2·363424
Earth,	95,103,000	2,817,409	1678 5	366·25	2·563777
Mars,	144,908,000	392,735	626·7	669·60	2·825815
Jupiter,	494,797,000	953,570,222	30879 8	10471·00	4·019988
Saturn,	907,162,000	284,738,000	16874·1	24620·00	4·391288
Uranus,	1,824,290,000	35,186,000	5931·5		

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* See Prof. Encke's Letter to Mr. Airy, dated Dec. 20, 1841.

† Edinburgh Philosophical Journal, for July, 1848.

The points of equal attraction between the planets severally (when in conjunction) are situated as follows:—

TABLE II.

	Miles from the former.	Miles from the latter.
Between Mercury and Venus, ...	8,029,600	23,943,400
" Venus and Earth, ...	12,716,600	13,599,400
" Earth and Mars, ...	36,264,600	13,540,400
" Jupiter and Saturn, ...	266,655,000	145,710,000
" Saturn and Uranus, ...	678,590,000	238,538,000

It will be seen from the above that the diameter of the earth's sphere of attraction is 49,864,000 miles. Hence the diameters of the respective spheres of attraction of the other planets, according to my empyrical law, will be found to be as follows:—

	Diam. of Sph. of Attr'n.	Log.
Mercury, ...	19,238,000	1·283704
Venus, ...	36,660,000	1·564218
Mars, ...	74,560,000	1·872479
Jupiter, ...	466,200,000	2·668594
Saturn, ...	824,300,000	2·916127

Remarks.—The volumes of the sphere of attraction of Venus, Mars, and Saturn, in this table, correspond with those obtained from Table II; that of Mars extending 61,000,000 miles beyond his orbit, or to the distance of 206,000,000 miles from the sun. This is about two or three millions of miles less than the mean distance of Flora, the nearest discovered asteroid. That of Mercury extends about 11,000,000 miles within the orbit; consequently, if there be an undiscovered planet interior to Mercury, its distance from the sun, according to my hypothesis, must be less than 26,000,000 miles. Jupiter's sphere of attraction extends only about 200,000,000 miles within his orbit, leaving 89,000,000 miles for the asteroids. It is only in the most distant portion of this space, where small bodies would be less likely to be detected, that none have yet been discovered.*

The foregoing is submitted to your inspection with much diffidence. An author, you know, can hardly be expected to form a proper estimate of his own performance. When it is considered, however, that my formula involves the distances, masses, annual revolutions, and axial rotations, of all the primary planets in the system, I must confess I find it difficult to resist the conclusion that the law is founded in nature.

Very respectfully, your obedient servant,

DANIEL KIRKWOOD.

Mr. Walker then remarked, that it would be noticed from the contents of the letter, that Mr. Kirkwood offers for the consideration of the members, a subject of great interest to the cultivators of physical science.

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* It may be proper to remark that *one planet* between Mars and Jupiter, with a mass and mean distance of about double those of the former, would perfectly satisfy the conditions of my theory.

The slightest approach to an analogy, such as constituted any one of Kepler's harmonies, three of which turned out to be his three celebrated laws, should be examined with care, in order that its merits, if it have any, should not be overlooked.

Accordingly he proceeded at once to verify the numerical data and conclusions of Mr. Kirkwood. He found in them nothing requiring modification, except perhaps the substitution of some more recent values for the masses of Mercury and Uranus. He therefore communicated the subject confidentially to the American Philosophical Society, during his stay at Philadelphia, at their stated meeting, July 20; and in like manner, on the 23d, to Joseph Henry, LL. D., Secretary of the Smithsonian Institution. The next day he replied to Mr. Kirkwood.

The Secretary then read Mr. Walker's letter to Mr. Kirkwood, and the reply of the latter, as follows:—

Washington, July 24, 1849.

To Daniel Kirkwood, Esq., Pottsville, Pa.

Dear Sir:—Absence from the city, and pressing business, have prevented me from sooner answering your esteemed favor of the 4th.

I have tested your theorem with the most recent values of the masses of the primary planets, viz., those used by Encke in 1845, with the exception of Uranus, for which I used Adams's recent value, $\frac{1}{21000}$.

I find your quantity $\frac{n}{D^{\frac{3}{2}}}$ to be nearly constant for the primany planets Venus, the Earth, and Saturn. Such a coincidence is hardly attributable to chance, and seems to indicate a law of nature.

Doubtless, in your researches on the subject, your attention has been turned to Laplace's nebular hypothesis, from which one of your elements, viz., (*D*), is derived.

I think that the form of your constant may be readily deduced from the nebular hypothesis, in which case both theories will strengthen each other.

The subject is highly interesting to men of science, and I shall be glad to make your discovery public, through the medium of some of our public journals and scientific memoirs. Please let me hear from you at an early date.

Yours truly and respectfully,

Sears C. Walker.

Pottsville Academy, July 31, 1849.

Sears C. Walker, Esq., Washington, D. C.

Dear Sir:—Your favor of the 24th instant was received in due time; and I can assure you that I have read it with more than an ordinary degree of interest.

My attention was first turned to the subject of the planets' rotations about ten years since. How many hypotheses I have formed, tested, and rejected, and how many hours of solitary toil the subject has cost me, I shall not undertake to tell you. If, however, I am really coming to the shore at last, I shall not regret my labors. My health, during the last three years, has been so feeble that I could not study much on any subject. The theorem which I sent you had been lying on my table since August, 1848. A few months since, I sent it to Mr. E. C. Herrick, of New Haven. He declined, however, expressing any opinion on the subject, and suggested that I should submit it to yourself. It was, as you suppose, the nebular hypothesis that suggested my law of rotation.

* * * * *

I feel under great obligations to you for your offer to make what you call my "discovery" public "through the medium of some of our journals and scientific memoirs."

I regret that I have nothing in proper form for publication; and, as I am about leaving Pottsville, to spend my August vacation in the country, I shall not be able to give the subject attention before September. * *

Allow me to leave the matter entirely in your hands. Anything I have written is at your disposal. Should you see proper to publish an article, in your own name, giving me credit for suggesting the law itself, I should be highly gratified.

The mass of Uranus, $\frac{1}{21000}$, which you have used, is one of which I had not heard. Struve's value, mentioned in my former letter, was furnished me by Mr. Herrick. I labor under considerable disadvantage from the want of libraries and scientific journals.

I shall be glad to hear from you at any time.

Very respectfully, your obedient servant,

Daniel Kirkwood.

For the Journal of the Franklin Institute.

The Screw Propeller.

The question of the relative merits of the side wheel and screw propeller, as methods of applying steam power to the purposes of navigation, is one which has of late years engrossed much attention from Engineers, and seems still to be undecided; for the repeated failures which have hitherto induced so great a want of confidence in the latter form of wheel, may, we think, be attributable, not to the falsity of the principle involved, but to its injudicious application.

So far as theory is concerned, the screw propeller presents many and great advantages over the old plan, and as the results of practice do not appear to correspond to the hopes of improvement held out, we think that an inquiry into the reasons of such a discrepancy may not be amiss.

The advantages which should result from the use of the propeller are briefly these: a decreased cost and increased stowage for freight, and a more economical and equable result from the engine; both of which will, we believe, appear reasonable from the following considerations.

First, To develope an equal amount of power, propeller engines may be made much smaller than those for side wheel; for, by "equal power," is to be understood an equal amount of water converted into steam and used (at the same point of expansion) in a given time, or, as implying the same thing, an equal amount of boiler surface. Now, as propellers may be worked at a much higher number of revolutions than side wheels, it follows that a proportionably smaller cylinder may be used, in order to develope the same power. The engines, therefore, being smaller, will of course be less expensive, (making the whole cost less,) and will require less room in the vessel, thereby leaving more room for stowage. That this latter is not a trivial consideration, will appear from the fact that a pair of ordinary side lever engines, (which are generally used in this country,) attached to side wheels, require more than twice the space demanded by engines of the same capacity placed transversely in the vessel for attachment to the propeller shaft, not to mention an equal disparity in the *weight* of the machinery, whose diminution permits a decreased draft of water, and thereby lessens the resistance, or increases the speed of the vessel with the same consumption of fuel. As an example of this position, two side lever engines for a steamer of 900 tons require a space of 7500 cubic feet, and will weigh, including wheels, shafts, &c., 130 tons; while a pair of propeller engines for the same vessel, to give the same power, require 3500 cubic feet, and will weigh but 70 tons, including the propeller and shaft; thus effecting a saving of 60 tons and 4000 feet of space, which is equivalent to a stowage of 110 tons. So that nearly one-seventh more *weight* may be transported at the same expense, or if the cargo is of a bulky nature, *one-fourth* more freight may be carried without increasing the resistance.

But, Secondly, we argue that the use of propellers admits of a more economical and equable action in the engines. For a screw propeller *properly constructed*, always acts upon the water through every point of its surface with precisely the same pressure, because, in such a wheel, every point will advance through equal distances in the same time, thus making available every inch of the blades as propelling surface; while in side wheels, however large they may be, there is always a considerable difference in the velocities of the outer and inner points of the bucket, so that a portion of the bucket is *dragged* by the vessel, or is at least comparatively useless, while another portion moves at a velocity far exceeding it, and a part of the propelling power of the wheel is expended without an adequate result. Besides which, the side wheel acts upon the water, not in a direction opposite to the motion of the vessel, but enters and departs from it at an angle which increases with the diminution of the diameter; while in the screw, the pressure against the water is uniform in amount, and constantly in a direction parallel to the vessel's motion.

A practical proof of the value of such advantages is found in the fact, that the "slip" in the side wheel varies from 25 to 30 per cent., and in the propeller, when of proper form, only 15 to 18 per cent.

In heavy weather, at sea, this disparity becomes still more strongly marked, for here the motion of the vessel, and of the sea, causes the paddle wheels to be alternately immersed to a great depth, and entirely raised out of the water, thereby producing two evil effects: 1st, to yaw the vessel from side to side, and of course increase her resistance, it being evident that the continued immersion of one wheel only would cause the vessel to turn round; 2d, to produce an irregular and very trying strain on all parts of the engine, but especially on the shafts.

If, then, these are some of the advantages which ought to result from the use of the screw propellor, the question naturally presents itself, Why has not experience verified so plausible a theory? What have been the causes of so many failures? We need only point to the numerous small propeller craft which ply along our coast, to prove that at least one branch of our trade has received a valuable auxiliary in the screw; and we think that the reasons why it has not been equally successful in marine navigation, on a larger scale, and involving a higher speed, are principally to be found in a want of knowledge and calculation of the relations which should exist between the means and the end.

It must be remembered that, while the talents and experience of the last forty years have been expended, both in England, France, and America, in perfecting the side wheel and its applications, only ten years have elapsed since the screw propeller was introduced to the American public, of which five only have gone by since the first successful application of the principle to a large sea steamer;—that while the examples of the first-named plan are numberless, both in the old world and the new, those of the last are but few in number, and generally made under discouraging auspices;—that while the former has received the sanction of continued and successful use, the latter has to contend with that prejudice which always exists against new inventions; and, with these things in view, can it be a matter of surprise that there should be repeated, and, in some cases, disastrous failures? We have yet to learn from that expensive teacher, Experience, the best form to be given to the propeller, a point which has never been so decided as to leave no room for discussion. We have to learn the best shape for the vessel, for why, if side wheel steamers require a different form from sailing vessels, should it be unreasonable to suppose that the two kinds of steamers require different proportions? And, more than all, we must trust less to guess-work and use more calculation, both in proportioning the engines and propellers to each other, and to the work they have to do, and in disposing the machinery in the hull with a view to the speed and sea qualities of the steamer. This is, we are aware, a simple thing, and one easily arrived at, yet three-fourths of the failures which have disgraced the cause of propellers have been due, in great part, to an utter want of the necessary calculations.

And, despite the triumphant attitude of the advocate of side wheels, when pointing to the long list of sea steamers upon that plan, now built or in process of construction, we venture to predict the time, not far distant, when the experience of our commercial marine shall vindicate the just claims of the screw propeller, and entitle it to a higher degree of consideration than the much vaunted side wheel itself. HELIX.

For the Journal of the Franklin Institute.

Our Steam Navy.

Within the last twenty years, the navies of England and France have undergone a great change by the introduction of steamers, and in any naval contest this country, at the onset, would suffer from the want of a suitable number of vessels of that class. By the liberal aid which the English Government have extended to private companies, they have in reserve a very large number of first class steamers at a nominal expense. Our own government are now trying, in a measure, to make up for lost time, and contracts have been made with parties, who are to build the following steamers for the routes designated, with the understanding that, in case of war, the Navy Department may take the vessels at a valuation.

4 of 2700 tons, to run from New York to Liverpool.
4 " 2400 " " New York to New Orleans.
3 " 800 " " Panama to Oregon.
3 " 1800 " " New York to Bremen.

Of these vessels, there are 2 of the New Orleans line finished, 3 of the Pacific line, and 2 of the Bremen line; the rest are in a state of forwardness, and will probably be all done in 12 months. In addition to the above, there are 13 sea steamers, from 500 to 1000 tons burthen, employed in private service between New York and New Orleans, at the different ports, making an aggregate of 40,000 tons, which could be at the disposal of the government when required, although several of the vessels have no mail contract.

Having spoken of the private steamers, those that the government *may have*, I propose to go on, and speak of those vessels which really belong to the Navy, most of which have been built from the designs furnished by the proper departments, and may, therefore, be considered indicative of the ideas entertained at the Navy Department in relation to war steamers. This, of course, applies to those now building, and not to those already built, of which I shall speak first.

The first of the naval steamers we now have is the "Fulton," built about 12 years since. It is much to the credit of the Department, that no person has been willing to assume the responsibility of having designed this vessel; like Japhet, she has long been in search of a father, but without any prospect of success. She is now at anchor at the Brooklyn Navy Yard, being of no service, except to be used in the harbor of New York. The Department would do well to remove the machinery, which is very good, and, with some changes, would answer for a ship of 1000 tons; as she now is, she would not be safe out of the harbor, and cannot be considered as of any account when speaking of *sea steamers*.

Our second vessel is the "Mississippi," a fine steamer, built in 1841, about 220 feet long, 40 feet beam, 23 feet hold, with 2 English marine side lever engines, of 460 horse power, and 4 copper boilers for bituminous coal. This vessel has been in commission about 8 years, during much of which time she has been in active service, and has always given satisfaction. She has recently made the passage from Norfolk to Gibraltar in 16 days, with an average consumption of 30 tons of coal in 24 hours. The "Missouri," a sister ship, but with inclined engines, was burnt a few years since at Gibraltar.

Our third vessel is the "Princeton," a propeller. This ship is about 160 feet long, 30 feet beam, and 20 feet hold; has two semi-cylinder engines, and a propeller of 14 feet diameter; 3 boilers of iron, and uses a fan to increase the draft, natural draft not being sufficient to supply the required head of steam. This vessel may be considered the best of her class, and has done considerable service. She has just returned from a two years' cruise in the Mediterranean, and her hull has been condemned.

She was built in 1843, of white oak obtained in a hurry, and her rapid decay is, in a great measure, no doubt, owing to the great heat of the boilers.

Our fourth vessel is the "Allegheny," built of iron at Pittsburg two years since. She is about 180 feet long, 32 feet beam, and 19 feet hold. She is propelled by two of Hunter's submerged wheels, of 14 feet diameter, and 4 feet face, with engines of 60 inches diameter of cylinders, and 4 feet stroke; usual number of revolutions 30; 2 boilers for bituminous coal, with natural draft. The model of this ship is peculiar to this mode of propelling, being cut away under the water line, so as to allow the paddles to project. This vessel has been in service about two years, most of the time at Brazil and the Mediterranean, from whence she recently returned. Her speed at sea is not more than 6 miles per hour, and she is probably the last of her class, as this mode of propelling has nothing to recommend it to favor.

Our next vessels are the "Massachusetts" and "Edith," propellers, both now in the Pacific. These vessels were bought from private service during the Mexican War, and were transferred to the Navy Department at its close. They are about 500 and 700 tons, with a speed of from 6 to 7 miles per hour, and would most likely be used as transports.

The "Water Witch" comes next, a small iron steamer, with side wheels. She was originally built with Hunter's wheel, but condemned, then lengthened and Loper's propeller put in; she then made the passage from Philadelphia to Norfolk, was then again condemned, and a condensing engine and side wheels put in. She is now considered a fair vessel of about 250 tons.

The last we have is the "Vixen," a small vessel 118 feet long, 22 feet beam, and 8 feet hold, originally built for the Mexican Government; engine with 36-inch cylinder, 6 feet stroke; speed 8 miles per hour. This and the "Spitfire," a sister vessel, were constantly employed, during the Mexican War, on the coast of Mexico, where their light draft of water rendered them invaluable.

These are all the vessels at present belonging to the Navy that are finished, and can be brought into use on our seaboard. I will continue the subject, and speak of the steamers now building in your next. X.

For the Journal of the Franklin Institute.

The Propeller Steam Ship "Carolina."

This fine steamer made a trial trip on Tuesday, the 25th of September, and, I understand, gave general satisfaction to her builders, and met their fullest expectations. I therefore furnish you with the following particulars of her construction: Length over all, 164 feet; between perpendiculars, 149 feet; length of keel, 139 feet; breadth of beam 29 feet; and depth of hold, 18 feet 6 inches.

She has two direct action condensing steam engines, with the cylinders placed directly over the shafts. Diameter of cylinders, 44 inches, and 3 feet stroke. One engine is directly abaft the other, and both are attached to the same shaft, at right angles. There are two air pumps, of 30 inches diameter and 20 inches stroke. These pumps are geared from the propeller shaft by spur wheels, so arranged that, while the engines make 60 revolutions, the air pumps each make but 25 strokes. The object of this reduction of speed in the air pumps, (which is not a new idea,) was to avoid the shock produced on metal valves by high velocity. This objection is entirely obviated by the use of valves of vulcanized India rubber. By this great reduction in the speed of the air pumps, the relative capacity between them and the cylinders is very much changed, reducing them to about $\frac{1}{10}$th the capacity of the cylinders, while the usual proportion is $\frac{1}{6}$th. With a moderate pressure of steam, and cutting off at one-half, no difficulty may be found, but I think the air pumps would be found too small for a full pressure of steam, and working full stroke.

The propeller is Loper's, made of composition, 11 feet 4 inches diameter; angle at the hub, 20°; at the periphery, 48°. There are 4 blades, and the extreme width of each at the periphery is $7\frac{1}{2}$ feet. The pitch of the screw is such that, working in a solid, the centre of effort would advance $27\frac{7}{8}$ feet per revolution. On her trial trip she is reported to have averaged 42 revolutions per minute; the speed of the propeller was then $13\frac{3}{10}$ miles per hour. The speed of the vessel at the same time was 10 miles per hour. Pressure of steam, 20 lbs., cutting off at one half.

She has two boilers, and burns anthracite coal, with natural draft. Blowers are now being added, which will increase the pressure of steam, but with a corresponding increased consumption of fuel.

As a whole, the "Carolina" is a very creditable job. Messrs. Reanie, Neafie & Co., who built the engines, and Messrs. Byerly & Son, who built the hull, have certainly done justice to their work; and although I think it an error of judgment, on the part of those who designed her, to place the centre of weight so far abaft the centre of buoyancy, which renders it necessary to carry a considerable quantity of ballast to bring her on an even keel, still, as it has evidently been intentional, I suppose there are good reasons for it, although not made public. W.

FRANKLIN INSTITUTE.

Proceedings of the Stated Monthly Meeting, September 20th, 1849.

Samuel V. Merrick, President, in the chair.

Thomas Fletcher, Vice President.

Isaac B. Garrigues, Recording Secretary.

The minutes of the last meeting were read and approved.

Donations to the Library were received from—The Royal Geographical Society, London; E. M. Stanton, Esq., Pittsburg, Pa.; Major Alfred Mordecai, Washington City, D. C.; A. C. Morton, Portland, Me.; and from Prof. Jno. S. Hart, Prof. Jno. F. Frazer, Messrs. S. V. Merrick, F. Fraley, S. Norris, J. C. Trautwine, John C. Cresson, John E. Addicks, Emlen Cresson, Owen Evans, James C. Booth, Solomon W. Roberts, and Lea & Blanchard, Philadelphia, Pa.

Donations to the Cabinet of Minerals were received from Prof. John F. Frazer.

The Treasurer's monthly statement of the receipts and payments was read.

The Board of Managers and Standing Committees reported their minutes.

New candidates for membership in the Institute were proposed, and those proposed at the last meeting were elected.

Mr. I. W. P. Lewis, Civil Engineer, presented several models, and explained their design. 1st, A model of a cast iron lantern, for the dioptric apparatus for illuminating lighthouses. This model shewed the improvements that Mr. Lewis had introduced in the construction of lanterns since 1839, in which year he refitted Boston Lighthouse with a lantern of bronze, glazed with plate glass, 36 × 24 inches, and in 1840, refitted Cape Cod Light with a lantern of cast iron. The nature of the improvements consisted in so constructing the framework as to retain all the requisite strength, and yet to diminish the obstruction to the light from the apparatus, in its passage to the horizon. The reduction at the two lights named above amounted to several square feet. Another important point was in ventilating the lantern, and furnishing the keepers with facilities for admitting a copious and steady current of pure air to supply the combustion, and also to give free egress to the gases generated in producing the light, so as to prevent the condensation of their vapors on the glass of the lantern, which, in winter, soon forms a coating of ice or frost, and, in summer, keeps the glass and floor wet and uncomfortable. Mr. Lewis's aim had been to simplify the construction so as to reduce the cost; to avoid the mixture of metals, so as to avoid galvanic action, and to proportion the several parts so as to leave the weight and bulk easily manageable by three or four laborers, and therefore adapted for landing on any part of the coast, or raised to the top of a tower without the need of cumbrous machinery. 2d, A model of a trammel, for setting screw piles in deep water with all the accuracy that might be desired. This trammel had been tried with complete success on the works erecting on the Brandywine Shoal. The foundation piles had been screwed down with entire precision, and also the piles forming the ice-breaker, to protect the former. The trammel consisted of a triangular frame, with sleeves at the angles, and could be made to subtend any angle required by the nature of the work. 3d, A model in which the screw and atmospheric pile were shown in combination, the object being to obtain foundations in deep water on a large scale, using the screw pile as a guide for the descent of the atmospheric pile.

Mr. Alexander Bond presented a working model of a stern propeller, driven by two steam engines, which was put into operation during the meeting. The propeller is on the principle of a vertical scull, moving laterally in a peculiar curve, a clear idea of which cannot be conveyed without a drawing, which, with a description, may probably be given hereafter.

A universal chuck, invented by Messrs. Norton & Parry of this city, was exhibited and described.

A very highly finished working model of a press for making bricks from dry clay, was presented and put in action by the inventor, Mr. Thomas Culbertson, of this city, and elicited much admiration. Engravings illustrative of it, with a full description, will be given in the next number of the Journal of the Institute.

A number of beautiful articles made of gutta percha, from the establishment of Mr. John Thornley, of this city, was presented for the examination of the members, and a brief description given by the chairman.

Mr. Langenheim presented a very beautiful Talbotype portrait of a large size, which exhibited an improvement in the art; and also a Talbotype picture of the iron lighthouse, (intended for Carysfort Reef,) temporarily erected in the courtyard of the foundry of Messrs. Merrick & Towne, of this city, which attracted much attention from the members. The Chairman pointed out the applicability of this art for the illustration of machinery. The picture, surrounded by an elaborate gilt gutta percha frame, is now deposited in the rooms of the Institute.

Mr. George W. Yerger, of this city, exhibited a very light, and apparently durable and efficient artificial leg, the movements of which closely approximated to nature. It was shown in action, much to the satisfaction of the members.

A patent door-holder, invented by Mr. R. T. Fry, of this city, was submitted to the examination of the meeting. This door-holder operates by means of a spring of sufficient power to preserve the door in position, and to permit it to be closed, without lifting a latch, by a simple pull of the door itself. The model is left on deposit in the Cabinet of the Institute.

COMMITTEE ON SCIENCE AND THE ARTS.

Report on the Catoptric, Dioptric, and Catadioptric Systems of Lights for Lighthouses.

Appendix containing the Notes referred to in the Report.

Continued from page 252.

Note 5 *continued.* See the Appendix to the Report of 1845, to the British Parliament, before cited. Memorandum by Mr. Alan Stevenson. Also, the Notes on the Illumination of Lighthouses, by the same writer, before cited, containing the results of experiments on the loss of light by reflection, and the transmission of light by the dioptric lenses and the catadioptric rings.

Notes 6, 7, 8, 9, and 10. See the Senate Doc., No. 488, 28th Cong., 1st Sess. Also, the Report of Professors Pierce and Lovering, before cited. Also, the Letter of Leonor Fresnel, before cited. Also, the Annuaire, by Arago, before cited. Also, the Report to the British Parliament, before cited. Also, Report of Mr. I. W. P. Lewis, before cited. Also, Report of the Committee of the Royal Society of Edinburgh, before cited. Also, Art. 13, Vol. 127, p. 211, of the Philosophical Transactions of the Royal Society of London, for 1837, "On the Adaptation of the different modes of Illuminating Lighthouses," &c. In this paper, the relative effect of varying the sizes of the reflectors and lamps is discussed.

See also, Edinburgh Review, Vol. lvii, for 1833, Art. 8, page 169, "On the Construction of Polyzonal Lenses and Mirrors of great magnitude, for Lighthouses," &c., by David Brewster, LL. D., F. R. S. Also, Edinburgh Philosophical Journal, Vol. viii, p. 160, for 1823; "Account of a New System of Illumination for Lighthouses," by the same author; Edinburg, 1827. Also, Edinburg Review, Vol. lxi, 1835, Art. 13, 221, by the same. Also, the Communication from Messrs. E. & G. W. Blunt, of New York, before cited. Doc. 258 and 738, 25th Cong., 2d Sess. To the zeal and intelligence of these gentlemen, the United States are indebted for the introduction of the Fresnel system at the Neversink station, near New York.

A lenticular fixed light is to be erected on the Brandywine Shoals, in Delaware Bay, on a screw pile lighthouse. Another, a fixed and flashing light, with the *latest improvements*, is to be erected on an iron lighthouse on Carysfort Reef, Florida, (on piles of iron inserted into the rock of the reef.) Another has (the Committee have been informed) been ordered, of a singular pattern, which may be described hereafter. The lenticular light, (so called,) on the Battery of New York, does not pertain to the Fresnel system, and needs, at present, no further notice.

The documents relating to lighthouses, published by Congress, before cited, may be consulted for such defence as has been essayed of the system and practice pursued in the United States.

The Committee might cite many additional authorities, but their space is limited. They have, moreover, confined their references to the sources of information which are readily accessible to the citizens of this country.

BIBLIOGRAPHICAL NOTICES.

Principles of the Mechanics of Machinery and Engineering. By Julius Weisbach, *Prof. of Mechanics and Applied Mathematics in the Royal Mining Academy of Fribourg. First American Edition. Edited by* Walter R. Johnson, *Civil and Mining Engineer. In two volumes; illustrated with* 813 *engravings on wood. Vol.* 2.—*Applied Chemistry. Philadelphia: Lea & Blanchard.* 1849.

We are indebted to Messrs. Lea & Blanchard for the second volume of the American edition of Weisbach's Principles of the Mechanics of Machinery and Engineering, which we again recommend to our readers, as one of the fullest and most satisfactory works upon the subject of which it treats. We should like to see more upon the subject of American Water Wheels, some of which are of great merit; and a notice of them, although it would have increased the size, would, at the same time, have added very much to the value of the work to our mechanics. But we will not complain when we have so much that is good. The mechanical execution of this work is equal to that of the preceding volumes of the series. F.

A Text Book of Geometrical Drawing, for the use of schools, with illustrations for drawing plans, sections, and elevations of buildings and machinery; an Introduction to Isometrical Drawing, and an Essay on Linear Perspective and Shadows. Illustrated with 56 *steel plates, containing* 200 *diagrams. By* Wm. Minifie, *Architect. Baltimore: Wm. Minifie & Co.* 1849.

This is a very valuable and well executed work upon drawing, and will be, especially, highly useful to persons whose business requires them to make plans and perspective drawings of machines. The rules are correctly given, clearly stated, and well illustrated by good figures. F.

JOURNAL

OF

THE FRANKLIN INSTITUTE

OF THE STATE OF PENNSYLVANIA

FOR THE

PROMOTION OF THE MECHANIC ARTS.

NOVEMBER, 1849.

CIVIL ENGINEERING.

Extract from the Report of the Directors of the Boston and Maine Railroad to the Stockholders, September 12, 1849.

"From the time that the Boston and Maine Railroad was opened to Dover, in the autumn of 1841, down to December, 1847, there was a very regular increase in its business of about 33 per cent. per annum, till its gross receipts for the last mentioned year amounted to over a half million of dollars. The Directors, finding the income of the road thus increasing, and then so ample, with a prospect of a continued increase from the works commenced or projected at Lawrence, and from new connecting roads, as well as from a continued growth of business in the towns and villages on the main line, reduced the fares and charges for freight about 14 per cent. But unfortunately the money pressure became severe, and about this time began to be felt in a *comparative* reduction of business and travel upon most of the railroads, the Boston and Maine with others; causing a great falling off in the operations at Lawrence, and reducing the business of the railroad with that place to a small part of what had been calculated upon. In the meantime, this Corporation was making large expenditures for the purpose of being prepared to accommodate the business to be expected from Lawrence, and from the connecting roads then about to be opened into the interior of New Hampshire and Maine; all which preparations had been ordered or approved by the Stockholders. In addition to these untoward circumstances, affecting unfavorably the income of the road, the loss of the Salmon Falls bridge and the Dover fire had their influence. All these circumstances operated together to prevent an increase in the net income of the road, corresponding to the increased means and the increased expenditure. The effect, however, was not greater than should have been expected from such a complication of causes, all operating the same way. Notwithstanding all these disadvantageous circumstances, the net earnings of the road, over and above its expenses of operation and repairs, have been for the two years ending June 1st, 1849, an average of 8 per cent. per annum, and for the worst twelve months of this time, the last year, the net income was full 7 per cent.

"The result of this severe trial proves the unquestionable soundness of the enterprize; and it must give to the Stockholders and the public the greatest confidence in the future prosperity of the road."

Extract from the Report on the St. Lawrence and Atlantic Railroad, its Influence on the Trade of the St. Lawrence, and Statistics of the Cost and Traffic of the New York and Massachusetts Railroads. By A. C. Morton, *Civ. Eng.*

Looking at the favorable position of your road, connecting the Atlantic with the Western waters by the shortest practicable route, and extending down into the heart of the country requiring their breadstuffs, there does not appear to be any doubt that a very large portion of the supplies of the State of Maine, New Brunswick, and Nova Scotia, and parts of Vermont and New Hampshire, will be transported over your road and its branches, by which it will be delivered almost at the doors of the consumers.

The number of inhabitants within the States and Provinces above mentioned, who will receive their breadstuffs through this channel, and will otherwise contribute to its freight and passenger business, may, at the lowest estimate, be placed at eight hundred thousand souls.

The number of inhabitants in the vicinity of the road and its terminus in Canada is, at the present time, probably not less than one hundred and sixty thousand, and the total population in parts of Upper and Lower Canada, who will be benefitted by the road, and will contribute to its business, amounts to seven hundred thousand souls, making a total of one and a half millions of inhabitants who are directly or indirectly interested more or less in the construction of your road, and from whom you may expect business for its support. It is believed that, without reference to any supposed increase of the Western trade, your road, with so large a population for its support, would be a good dividend-paying road.

It will be found interesting and useful to refer to the practical working of the railways of the United States, and particularly those of Massachusetts directly illustrative of this subject. I have accordingly prepared tabular statements of a number of roads, showing the cost of construction, and of operating, the tons of freight and number of passengers transported, and the receipts for 1847.

By statement A, it will be seen that the thirteen roads embraced in the table have an aggregate length of $581\frac{1}{2}$ miles, and have cost £7,721,423; that the total income was £1,295,475, and the expenses of running and maintaining these roads were £661,317, which, being deducted from the receipts, leaves a net annual revenue of £634,104, equal to $8\frac{2}{10}$ per cent.

on the whole cost. The expense of running, &c., was 50 per cent. of the receipts. There were transported over these roads 5,336,988 passengers, and 1,724,888 tons of merchandise.

The number of inhabitants in the whole State of Massachusetts, and the counties of the other States through which those roads pass, amount to about one million. It therefore appears that the number of passengers transported on these roads is over five times the population of the country in which they are located, and that the amount of merchandise transported is about 1¾ tons to each inhabitant.

The large amount of travel and tonnage compared with the population is extraordinary, and must be attributed to the effects of railroads in stimulating every branch of industry, and promoting greater intercourse among the masses of the people.

These results appear more surprising, when it is recollected that those roads are chiefly confined to the limits of one small State, or an area of less than 8000 square miles, and that many of them run nearly parallel, and some are in direct competition with each other.

On account of the different state of the country and its improvements, and the different character and pursuits of a portion of the inhabitants, we should not be warranted in applying this proportion of passengers to the population along your road as a basis of revenue, but if, instead of taking five times the population, which is the practical result in Massachusetts, we assume that the number of passengers will be only equal to the actual population, and assuming the amount of freight to be ½ of a ton to each inhabitant in place of 1¾ tons, as shewn by the operation of those roads, it would appear a safe estimate of the business of your road, without reference to the great and increasing trade of the West.

Making a proper classification of the number assumed, (16,000,) and dividing them into "through" and "way" passengers in such proportion as the character of the business on your road appears to require, and applying the ordinary rates of transportation, we have, as the annual gross receipts for freight and passengers,

receipts for freight and passengers, ...	£115,000
Deduct for expenses of running, management, &c., say 50 pr. ct.,	57,500
Giving a net revenue of	57,500

Which is equal to about 7 per cent. on £850,000, the estimated cost of the road.

The Western Railroad is the only one embraced in the table before referred to, having a connexion with other improvements, by which it receives the benefit of western trade.

It more nearly than any other resembles your road as regards its length, connexions, and design, forming, with the Boston and Worcester Road, the last of the series of railways extending from Buffalo to the Atlantic, connecting also with the Erie Canal at Albany. It, however, differs from it in the larger amount of curvatures and heavier grades, the maximum inclination being 83 feet per mile.

It has to contend with strong competition with another railroad, and with the Hudson river during the season of navigation, yet, notwithstanding these disadvantages, and its extravagant cost, the net revenue in 1847 amounted to 8 per cent. on £2,192,000, its present cost.

The gross receipts, the first year, after the whole line was opened, and before its connexions were perfected, were £919 per mile of road, which, if applied to your road, the length of which is 127 miles, would produce £116,713, or deducting 50 per ct. for expenses, a net revenue of £58,356, which is nearly 7 per cent. on the estimated cost. It is, however, maintained that the position and connexions of your road, as a channel through which the western trade may reach the seaboard, are far superior to this.

The St. Lawrence river, with its ship canals, and the great lakes, opens an inland navigation, which, for its extent, capacity, and economy of transportation, is not surpassed by any in the world.

The total distance through the St. Lawrence and the lakes to Chicago, from Montreal, is 1330 miles, and in this distance there are but 66 miles of canal navigation. If we include the navigation of Lake Superior and Strait St. Mary's, which require but about one mile of canal to perfect the navigation, and which will soon be completed, we have a total extent, including the distance laterally to Chicago, of 1726 miles, having only 67 miles of canal navigation.

The Welland canal is designed for vessels of 400 tons, and the St. Lawrence canals for vessels of much larger tonnage. These improvements are completed, and were first brought into use last year.

This channel of trade, therefore, is not yet fully known or appreciated, and there has not yet been time to realize the benefits which will result from experience and improvements in the manner of conducting the business of transportation, and the effects of competition in lowering rates.

The amount of up trade has an important bearing on the cost of down freight; and this being largely increased by the completion of your road, will doubtless still further reduce the rates of transportation.

The following table exhibits the leading features of the route from Cleveland to Boston, *via* the Erie Canal and Western Railroad, and the St. Lawrence route, from the same point *via* the Portland Railway to Portland.

ROUTES.	Length of Lake and River Navigation—miles.	Length of Canal Navigation—miles.	Tonnage of Vessels—tons.	No. of Transhipments.	Length of Railway—miles.	Maximum Grade—feet per mile.	Time occupied in reaching Seaboard—days.
To Boston, *via* Erie Canal and Western Railroad,	200	363	*80	2	200	83	14
To Portland, *via* St. Lawrence River and Portland Railway,	534	66	400	1	275	50	8½
Difference,	334	297	320	1	75	33	5½

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* Taking one of the heaviest laden boats per day, which arrived at West Troy from Black Rock, the average for the year 1848 was 71½ tons. (Canal Commissioners' Rep., Jan., 1849.)

The following statement exhibits the cost of transporting flour per barrel on these routes.

Erie Canal Route.

From Cleveland to Buffalo,	12 cents.
“ Buffalo to Albany,	70 “
“ Albany to Boston,	30 “
Total to Boston,	112 “
If carried thence to Portland,	10 “
Total to Portland,	122 “

St. Lawrence Route.

From Cleveland to Montreal,	40 cents.
“ Montreal to Portland,	45 “
Total to Portland,	85 “
If carried thence to Boston,	10 “
Total to Boston,	95 “

From this it appears that, adopting the average rates of transportation on the Erie Canal of the lowest month in each year, for a number of years, which is 7 cents per barrel less than the average of 1847, and the lowest summer rates on the Western Railroad, the cost of delivering flour at Boston is 112 cents per barrel, and if forwarded to the State of Maine, an addition of 10 cents, making a total of 122 cents per barrel.

By the St. Lawrence route, the cost of delivering a barrel of flour, allowing the charge on the Portland Railroad to be 45 cents per barrel, and taking the actual rate at which it has been carried from Cleveland to Montreal, (40 cents,) we have a total charge of 85 cents, making a difference in favor of the route *via* the Montreal and Portland road to the seaboard, of 27 cents per barrel.

If, however, we make the charge on the Portland road, without reference to the difference in grades, the same, in proportion to its length, as is charged on the Western Railroad, the cost will be reduced to about 41 cents, or a total from Cleveland to Portland of 81 cents, giving a difference of 31 cents per barrel in favor of the St. Lawrence route.

Making Boston the terminus of both routes, there is still a difference of 17 cents per barrel in favor of the St. Lawrence route *via* Portland to Boston.

The difference in time required to perform a passage from Cleveland to the seaboard, is 5½ days in favor of the St. Lawrence and Portland route.

The greater extent of canal navigation, and an additional transhipment, add not only to the time required, but materially increase the cost of transportation on the Erie Canal route over that of the St. Lawrence.

The former has 363 miles of canal navigation, while the latter has only 66 miles, and most vessels navigating the St. Lawrence pass down the river instead of the canals, so that in the downward passage there are but about 36 miles of canal navigation.

The Erie Canal is navigated by vessels of small tonnage, drawn by horses at the rate of 2½ miles per hour, while the Welland and St. Lawrence Canals are navigated by steam vessels which pass through the lakes and the river to Montreal, without breaking bulk, in half the time, and with about four times the number of tons in each cargo. The vessels on the former route can carry from 700 to 800 barrels of flour, but those of the latter carry 3000 barrels.

These disadvantages of the Erie Canal route cannot be overcome by the enlargement of the canal or other improvements.

It may be said that the Oswego route to Albany is preferable as regards cost and the time required to make the trip. Grant that this is the case; the difference is not enough to affect the comparison materially.

The distance is about the same, and there are still 237 miles of canal navigation, an increased amount of lockage of about 200 feet, with the same disadvantages of small cargoes and transhipments as by the Erie Canal route.

The estimated number of passengers for the Boston and Worcester Road, before it was completed, was 23,500, and before the opening of the Norwich and Worcester and Western roads, which connect with it, they amounted to 78,000, and in 1847 to 548,000. The number of passengers estimated to pass over the Eastern Road was 121,700; in 1847 the actual number transported was 893,000. The estimated number for the Fitchburg Road was 71,790; there were transported the first half year, with only half that road in operation, nearly 10,000 more passengers than were estimated for the whole road the whole year, and in 1847 the number was 484,000. The passengers estimated to pass over the Boston and Lowell Road were 37,400, and the net receipts were estimated at $36,000; the former amounted in 1847 to 484,000, and the latter to $195,000.

The astonishing increase of trade on the Western Lakes within a few years, is such as to render it difficult to assign any proper limits to its future advances.

In 1835, the State of Ohio was the only exporting State on the lakes, and during that year there arrived at Buffalo 86,000 barrels of flour, and 98,000 bushels of wheat.

The following statement shows the amount of the principal productions of the Western States which arrived at the same port in 1845 and 1847, and the increase.*

Year.	Flour. barrels.	Pork and Beef. barrels.	Staves. M.	Wheat. bushels.	Corn, Oats, & Rye. bushels.	Butter. kegs.
1847	1,857,000	80,000	8,800,000	6,489,100	3,379,087	101,584
1845	746,750	57,060		1,770,740	78,470	19,975
Increase	1,110,250	22,940		4,718,360	3,300,617	81,605

The above is exclusive of the large amount of lake trade which went through the Welland Canal.

In 1837, the wheat and flour passing Lakes Erie and Ontario, to be forwarded to market through the Erie Canal, amounted to only about 35,000 tons, while in 1847 the amount was 486,000 tons.

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* Compiled from the Report of the Commissioner of Patents, to Congress, 1847.

By referring to the amount of shipping on the lakes at various periods, its tonnage and value, and the value of the commerce, we may, perhaps, form a more just appreciation of its importance, and the astonishing increase of trade within a few years.

In 1825, there were but thirty or forty small craft and one steamboat of 350 tons burthen on Lake Erie, and the first steamboat passed through Lake Michigan in 1826 or 1827.

In 1845, there were on the Lakes, above Niagara Falls, 60 steam vessels, having an aggregate tonnage of 23,000 tons, and 320 brigs and schooners of 53,000 tons, the whole costing $4,600,000.[*]

The shipping of all the lakes in 1846 amounted to 136,836 tons, and was valued at $6,000,000. The amount of merchandise transported that year was 3,861,088 tons, while that of 1841 was 2,071,802 tons, showing that the trade had nearly doubled in five years. The number of passengers transported in 1846 was 250,000, and the value of this business was estimated at $1,250,000.[†]

The value of lake commerce in 1847, according to the Report of the Hon. Washington Hunt, made to Congress, was over $141,000,000, or only $13,000,000 less than the value of all the exports of the United States in 1848, and nearly double the value of all the products received at New Orleans in 1846–7 by the Mississippi river.

In all the immense territory which surrounds the great lakes, and which now produce this surprising amount of commerce, there was in 1816 but one organized State, and the total population did not exceed 500,000 souls.

At the present time, there is a cluster of six large States about these waters, containing a population of between four and five millions of inhabitants.

Embracing the States and Territories whose trade will float over these lakes to an eastern market, we have an area of nearly 300,000 square miles, or an extent of territory three times as large as the Kingdom of Prussia, and nearly twice as large as France.

Tabular Statement of the Length and Cost of the Railways from Albany to the Falls of Niagara, and net income in 1848, as compiled from the official returns made to the State Engineer and Surveyor, January 20, 1849.

Name of Railroad.	Length of Road in miles.	Total Cost.	Average cost per mile.	Net revenue per cent. on cost.
Albany and Schenectady,	16·91	$1,606,196	$94,985	6·2
Utica and Schenectady,	78·00	3,227,946	41,384	10·4
Syracuse and Utica,	52·80	1,968,036	37,273	13·1
Auburn and Syracuse,	26·00	1,125,886	43,303	9·1
Auburn and Rochester,	78·00	2,644,520	33.904	10·0
Tonawanda,	43·50	974,865	22,410	18·2
Attica and Buffalo,	31·50	821,313	26,073	10·3
Buffalo and Niagara Falls,	22·00	250,396	11,381	14·2
	348·71		Average,	12·2

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[*] Letter on Lake Commerce, 1846; by James L. Barton, Esq.

[†] Report to Congress of J. J. Abert, Col. Corps Top. Engineers, 1848.

AMERICAN PATENTS.

List of American Patents which issued in the month of March, 1849, *with Exemplifications, by* Charles M. Keller, *late Chief Examiner of Patents in the U. S. Patent Office.*

1. For a *Machine for Trimming, Smoothing, and Folding Cotton Cloth;* John Higgins and Hiram H. Higgins, East Greenwich, Kent county, Rhode Island, March 10.

Claim.—"What we claim is the before described new organization of horizontal and vertical cylindrical brushes and a set of draw rollers, as arranged, combined, and operating together, in manner and for the purpose designated.

"We also claim the revolving cylindrical brushes, (either with or without the vertical brushes,) the set or system of draw rollers, and the folder or folding apparatus, in combination with one another, and arranged and operating together in the manner and for the purpose explained."

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2. For an *Improvement in Looms for Weaving Brussels Carpets, &c.;* Erastus B. Bigelow, Boston, Massachusetts, March 10.

The patentee says,—"My improvements consist in the manner in which the wires, over which the pile is wrought, are introduced between warps."

Claim.—"What I claim as new, is the toothed guides, employed in the manner and for the purpose set forth, or in any other way which shall accomplish the same end by analogous means. I also claim the combination of the toothed guides with the wire box or trough."

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3. For a *Punching Machine with a Combination of Adjustable Gauges;* Richard S. Tilden, St. Louis, Missouri, March 10.

Claim.—"What I claim as my invention, is the combination of the graduated scale rods and adjustable gauges with the movable gauges, and also, the combination of the said graduated scale rods, and adjustable and movable gauges, with the series of dies and punches."

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4. For an *Improvement in Fire Escapes;* George A. W. Hüttman and Geo. K. Kornelio, Philadelphia, Pennsylvania, March 10.

The patentees say,—"The principle upon which we construct the elevating and supporting frame of our ladder, is that of forming two or more sets, of two pairs each, of folding jointed lattice pieces, or oblique braces, capable of being placed at different angles with each other, or of being folded down upon each other in a compact form, and thus rendered portable in a carriage not larger than that of an ordinary fire engine. Each of the pairs of folding pieces, or braces, is connected by a bolt through its centre, with a third bar shorter than the other two, and which, when the frame is elevated, and the platform or scaffold carried to its full height, stand in a vertical position, while all the other frame pieces are inclined in a given angle to each other, and to the horizon. Our ladder, when elevated, is either a stair case, with the flights of steps alternately placed on one side and the other, within the lattice framework, or a series of common or of flexible ladders."

Claim.—"What we claim as our invention, is the manner of bringing the upright or vertical jointed bars of the framework into their erect position, by means of the tumbling shaft, slat, pin, arm, and flap, when acted upon by the horizontal frames, which are moved towards each other by a right and left hand screw, or other equivalent machinery.

"We also claim the manner of bringing into their position on the notched revolving block, and of sustaining thereby, the vertical jointed bars, as likewise that of removing the feet of the upright from said blocks, when the frame is to be lowered, in the manner and for the purposes set forth."

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5. For an *Improvement in Stoves for Heating Apartments;* James Shields, City of New York, and James Cole, Cincinnati, Ohio, March 10.

The patentees say,—"The nature of the first part of our invention consists in combining the chamber of combustion, in which the fuel of any desired kind is burned, with a drum or chamber for the combustion and circulation of the inflammable matter evolved from the combustion of the fuel, by means of what we term a 'throat,' through which the products of combustion pass from the chamber of combustion to be inflamed in the said throat and drum.

"The second part of our invention consists in admitting a jet or jets of atmospheric air to the throat which forms the communication between the chamber of combustion and a drum or furnace chamber, that the inflammable gases evolved from the combustion of the fuel, in the fire chamber, may be mingled with the atmospheric air in their passage through the throat, and be thereby inflamed, and pass, in an inflamed and inflaming state, into the drum, or heating or working chamber of a furnace, that the flame may circulate beyond the throat, and then return to the exit pipe, which, in a vertical apparatus, is placed below the upper aperture of the throat, the equivalent position being retained when the position of the apparatus is changed, this arrangement preventing the flame from taking a direct course to the discharge pipe.

"The third part of our invention consists in making the lower aperture of the throat larger than the upper aperture thereof, that the inflammable gases and atmospheric air may be the better co-mingled in their passage through the throat, and thereby insure a more perfect combustion.

"The fourth part of our invention consists in making the throat with an enlargement between the lower and upper apertures, that the gases that enter the throat from the chamber of combustion may have room to mingle with the supply of atmospheric air, before they pass up and out of the smaller aperture above into the drum."

Claim.—"What we claim as our invention, is, 1st, admitting atmospheric air to the throat which forms the communication between the chamber for the combustion of the fuel, and the drum, that the inflammable gases evolved from the combustion of the fuel in the fire chamber, may be mingled therewith in passing through the said throat, and be thereby effectually inflamed, and pass in an inflamed and inflaming state into the drum.

"2d, We claim making the lower aperture of the throat, that forms the communication between the fire chamber and drum, larger than the upper aperture thereof, that the inflammable gases and atmospheric air may be the better co-mingled in their passage through the throat, and thereby insure a more perfect combustion.

"And finally, we claim making the said throat with an enlargement between the upper and lower apertures thereof, that the gases that enter the said throat may have room to mingle with the supply of atmospheric air, before they pass up and out of the smaller aperture above into the drum."

6. For an *Improvement in the Delivery and Take-up Motion of Looms;* Amos H. Boyd, Saco, York county, Maine, March 10.

Claim.—"What I claim as my invention, is the combination of a set of two or more feed rollers, and mechanism for operating them, with the yarn beam and take-up motion or mechanism of the loom; the whole being arranged and made to operate together as specified; the said feed rollers serving not only to firmly hold the warps under the beating up action of the reed, but to deliver them out at the rate required."

7. For an *Improvement in Cotton Presses;* Thomas Ashcraft, Randolph county, Alabama, March 6.

Claim.—"What I claim as new, is the combination of the movable end board, its guides and supporting wedges, with the moving packing box and stationary platen. I likewise claim constructing the press box with the upper part of its sides and ends slightly inclined outwards."

8. For *Improvements in the Let-off Motion of Looms,* Jeremiah Myers, Biddeford, York county, Maine, March 10.

The patentee says,—"My invention is what may be termed a 'positive' let-off mechanism, or combination of mechanism, its object being to regulate the rotary movement of the warp beam, in such manner that the warps may be delivered from it in a regular and uniform manner. Also, that, when the motions of the lay are arrested by what is termed the stop-motion, or stoppage of the loom, the said rotary movement of the warp roller may be simultaneously stopped."

Claim.—"What I claim as my invention, is the combination composed of the gear, screw, shaft, ratchet wheel, pawl, lever, bar, a bent lever, composed of the arm V, shaft W, and arm *i*, or otherwise properly made, roller, one or more cams, the spring, the slide plate, and arm P and weight, as applied to the warp beam and roller, and made to operate together as specified.

"And I also claim, in combination with the above described mechanism for operating the warp roller, the stop-motion or mechanism applied to the same, and the spring stop lever of the loom, the said stop-motion consisting of the shaft, and its arms, rod, notched lever, and its spring."

9. For an *Improved Spike Machine;* Marcus Maxim, Newcastle, Mercer county, Pennsylvania, March 10.

The patentee says,—"The nature of my invention and improvement consists in a certain new and useful combination of dies, so shaped, and arranged, and operated, that their combined action, at their appointed times, flattens or points the forward end of the spike rod, simultaneously with the operation of finishing the sides and point of a spike previously cut from the spike rod, and passed into a set of finishing dies; then heading the spike and discharging it in a finished state; and then advancing the spike rod, thus previously pointed, into the finishing dies, and, whilst therein, having a portion of it cut off for another spike; the several operations of pointing the spike rod, finishing the point of the spike, heading the spike, and discharging the finished spike, being performed at every revolution of the cam shaft of the machine.

"Also in the use of a sliding guide and holder, which holds the spike rod on the bottom die whilst a portion of it is cut off for a spike, said spike and holder retiring out of the way while the spike is being pressed in the dies.

"Likewise in a novel arrangement and application of a gauge, for gauging the length of the piece of iron cut off from the spike rod, to form a spike, and for conveying it, when cut off, to the heading die. And in a new arrangement of a stationary cutter, for cutting the piece of iron to form the spike from the rod."

Claim.—"What I claim as my invention, is the combination of the dies, gauge hold, and cutter, arranged and operating as described, for making wrought spikes from a spike rod in a cold or heated state; the spike rod being flattened at one end, and the spike gauged, pointed, headed, and discharged, at every revolution of the cam shaft."

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10. For a *Machine for Cutting Teeth for Beveled Gear;* Geo. H. Corliss, Providence, Rhode Island, March 10.

The patentee says,—"The first part of my invention consists in the use of a reciprocating cutter, governed by a guide bar, on which the cutter carriage slides, and which has its axes of vibration, to adapt the cutter to the required depth of cogs, at the apex of a cone corresponding with the bevel of the wheel to be cut, whether such axes be fixed or adjustable to wheels of different sizes, that all the cuts may be in the direction of the radii.

"The second part of my invention consists in combining the guide bar, on which the cutter carriage runs, with a secondary frame, hinged to the main frame, outside of the circle of the largest wheel intended to be cut in the machine, that the axis of vibration of the guide bar may be elevated or depressed, to adapt the machine to different bevels, and that the main driving shaft, which communicates motion to the operative parts of the machinery placed at the hinged end of the said frame, may be in the line of the axis of vibration of the said frame, that the vibration thereof may not change the relative position of the driving shaft, and the parts receiving motion therefrom.

"The third part of my invention consists in combining with the guide bar a guide plate, against which it bears by means of a weight, spring, or the equivalent thereof, so that, as the guide bar descends to give the proper depth to the cogs, the said guide bar shall follow the curve of the guide, and thus determine the form of the face of the cogs.

"And the last part of my invention consists in making that part of the rear end of the guide bar which rests against the guide, movable, so as to have an endwise motion in or on the said bar, in the direction of its length, the said movable part or stem being beveled back of where it rests against the guide, and so connected, either with the guide bar or some other part of the machinery, that, at the time of the cutting motion, it will move forward, that its bevel surface may be brought in contact with the guide, and give a lateral motion to the guide bar, to relieve the cutter from the surface of the cog that is being cut, to admit of its moving back clear of the cog, and then, at the end of the return motion, a reversed motion, to bring the cutter in the proper line for cutting."

Claim.—"What I claim as my invention, is, 1st, the method of cutting the cogs of beveled wheels, by means of a reciprocating cutter, that moves in or on a slide, (or slides,) that vibrates on an axis that coincides, or nearly so, with the apex of a cone representing the bevel of the wheel to be cut, by which vibration the depth of cut is determined; and this I claim irrespective of the adjustment of the axis of vibration.

"2d, I claim the guide bar (or its equivalent) on which the cutter carriage runs, and having its axis of vibration for the depth of cut as above described, when combined with a secondary frame, jointed to the main frame at some point outside of the circumference of the wheel to be cut, that the machinery may be adapted to the cutting of cogs on various bevels.

"3d, I claim, in combination with the guide bar, having an universal joint, or the equivalent thereof, and operated as described, in combination with the guide plate, to guide the cutter and determine the form of the face of the cogs.

"And lastly, I claim making that part of the guide bar which rests against the guide plate, to determine the form of the face of the cogs, separate from, and movable on, the guide bar, and properly beveled to relieve and clear the cutter for its back movement."

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11. For an *Improvement in Cut-off and Working the Valves of Steam Engines;* George H. Corliss, Providence, Rhode Island, March 10.

The patentee says,—"The object of the first part of my invention consists in supporting the shaft of the working beam on two vertical standards, that are erected on two horizontal beams secured and resting at the ends on the bed, the upper end of the two standards being connected to, and braced with, the ends of the horizontal beams by means of diagonal tension screw braces.

"The second part of my invention consists in communicating motion to the two valves from one rock shaft, by connecting each valve with a separate arm or crank-wrist of the rocker, the two arms making such an angle with each other, that the point of connexion of the closed valves shall vibrate near the dead point, while the other, which is being opened and closed, is moving along that part of its circuit which shall give the greatest longitudinal motion.

"The third part of my invention relates to the method of regulating the cut-off of the steam in the main slide valves, and consists in effecting this by means of the governor which operates cams, so that, when the velocity of the engine is too great, these cams shall be moved by the centrifugal action of the regulator, that a catch on the valve rods may the sooner come in contact with them, to liberate the valves and admit of their being closed by the force of springs or weights, and thus cut off the steam in proportion to the velocity of the engine."

Claim.—"What I claim as my invention, is, 1st, the method of operating the slide valves of steam engines, by connecting the valves that govern the ports at opposite ends of the cylinder, with separate arms of the rock shaft, or the mechanical equivalents thereof, so that, from the motion thereof, the valve that keeps its port or ports closed, shall move over a less space while its port (or ports) is closed, than the one that is opening its port or ports, and vice versâ, while at the same time the two arms by which they are operated have the same range of motion, whereby I am enabled to save much of the power heretofore required to work the slide valves of steam engines, and by which, also, I am enabled to give a greater range of motion to the valves at the periods of opening and closing the ports, to facilitate the induction and eduction of steam. And lastly, I claim the method of regulating the motion of steam engines, by means of the centrifugal regulator, by combining the said regulator with the catches that liberate the steam valves, by means of movable cams or stops, as described."

12. For an *Improvement in Drying Grain;* Henry Quinn, New Alexandria, Hunterdon county, New Jersey, March 10.

The patentee says,—"The object of my invention is to reduce the cost of the apparatus and its liability to derangement, and, at the same time, to dry the grain with a reduced consumption of fuel, all of which I effect by causing the grain to descend from a hopper, over and down a heated inclined plane to a stationary drying pan, over which it is moved slowly by a rake."

Claim.—"What I claim as my invention, is the method of drying grain in an open stationary pan, having the fire and draft below it, with the rake above, for stirring the grain and causing it to pass from the feeder to the delivery, as described, whereby the moisture in the grain is more readily evaporated and liberated, and the apparatus constructed at less cost, and with less liability to derangement, than by any other plan before known, when this is combined with the feeder heated by a hot air chamber, whereby the grain is gradually heated in the feeder, to draw out the moisture, before it is exposed to a higher temperature in the pan to be evaporated."

13. For an *Improved Tubular Two-part Rail;* John Elgar, Baltimore, Maryland, March 10.

The patentee says,—"My invention consists in forming a rail that shall combine, as near as may be, the properties of a rail were it made in one piece, without joints, the whole length of the line of railway."

Claim.—"What I claim, is the forming of each part of a two-part compound break-joint rail as described, so that, when bolted together with a vertical joint, they form a tube. And I also claim, in combination with said rail, a core of iron, inserted at each semi-cross joint in the hollow of such a rail, with the view of obtaining equal strength at those points with any other part, and of holding each part in its place vertically at the cross-joints. I claim the staunchion, to be bolted or nailed to the side of the sleeper for the support of the rail."

14. For an *Improved Door Lock by a Combined Key and Gauge; also, a Thief Detector;* Francis C. Goffin, Philadelphia, Pennsylvania, March 10.

Claim.—"What I claim as my invention, is the thief-detecting slide, in combination with the tumblers and the protuberance, and the springs and levers by which it is operated, and the key gauge or register, in combination with a key having sliding bits."

15. For an *Improvement in Rope Machinery;* Wm. Joslin, Waterford, Saratoga county, New York, March 10.

The patentee says,—"The improvements I have made in my patented machine relate to the employment of, 1st, a combination of rubbers, levers, sliding connecting rods, tribranched connecting plate to which the rods are attached, and a tribranched lever, and sliding weight suspended to an inclined arm of said tribranched lever, and a movable graduating rod for governing the descent of the weight over the inclined arm of the lever, for producing the requisite degree of friction on the bobbins, for the purpose of causing the several strands to have the same degree of tension on leaving the spools. 2d, In the employment of two expansive pulleys, revolving with the flyer, for graduating the twist of large or small rope. 3d, In the employment of a sliding toothed band or ring, placed over the periphery of a wheel on the axle of the expansive pulley, endless chain, friction bars, spring, and screw to graduate the friction of the band, for causing the reel to reel the cordage at a uniform degree of speed. 4th, In the employment of horizontal parallel rods, arranged between the inner standard of the spool frame and the inner standard of the flyer frame, and let into the same."

Claim.—"What I claim as my invention and improvement on my patented machine for making cordage, is, 1st, the manner of producing and diminishing the friction on the bobbins, so as to keep up a uniform strain on the strands as they are drawn off. Also, to prevent kinking and too fast unwinding.

"2d, I likewise claim the employment of the sliding toothed ring and endless chain, in combination with the toothed pulley and perforated wheel, friction bars, spring, and screw, for graduating the friction on the toothed band, to cause the reel to wind up the rope as fast as delivered from the expansive and contractile pulleys."

16. For an *Improvement in Cultivators;* Jeremiah Warner, Reading, Berks county, Pennsylvania, March 13.

The patentee says,—"The nature of the first part of my invention relates to the mode of adjusting the teeth relatively to one another along the breadth of the frame. And the second part of my invention relates to the adjustment of the cutting edge, so as to cut in more or less."

Claim.—"What I claim as my invention, is connecting the teeth of cultivators to the frames thereof, by attaching them to blocks adapted to slide in the frame, and provided with screws for regulating their position relatively to one another, and to the draught beam.

"I also claim as my invention, connecting the teeth by means of a hinge or other turning joint, and provided with the jointed screw brace, the said joints and screw braces being attached to the sliding blocks to which the teeth are attached."

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17. For an *Improved Horizontal Spark Arrester;* T. Willis Pratt, Springfield, Hampden county, Massachusetts, March 13.

The patentee says,—"The nature of my invention consists in the formation of a spark arrester, and its connexion with the fire box of a locomotive, so as to give great surface for wire gauze or perforated plate, for the passage of the smoke, and a ready discharge for the sparks into the fire box, while, at the same time, the symmetry of the engine is kept up, and a very small surface is exposed to the resistance of the air in running."

Claim.—"What I claim as new, is the cap or horizontal pipe, with perforated top expanded, and connecting with the fire box."

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18. For an *Improvement in Double Scale Balances;* Thaddeus Fairbanks, St. Johnsbury, Caledonia county, Vermont, March 13.

Claim.—"What I claim as my invention, is the graduated scale, and sliding or movable weight thereof, in combination with the balance beam, having arms of equal lengths, and its two scale pans or platforms for sustaining weights, the whole being constructed and made to operate in manner and for the purpose specified."

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19. For an *Improvement in Apparatus for Operating Shuttle Boxes of Looms;* James A. Bowie and Charles Carr, assignees of Robert B. Goodyer, Philadelphia, Pennsylvania, March 13; (anté dated September 13, 1848.)

The patentees say,—"The nature of our invention and improvements consists in the application of a new and more simple method of raising the shuttle boxes, by means of which almost an infinite number of patterns may be woven."

Claim.—"What we claim as our invention, is the combination of the index wheel, having movable pins of different lengths, with the shoe, having projections adapted to the pins, for the purpose of raising and falling the shuttle boxes."

20. For an *Improved Combined Railroad Bar;* Alfred B. Seymour, Bordentown, Burlington county, New Jersey, March 13.

Claim.—"What I claim as my invention, is making rails in two parts, divided by a longitudinal and vertical plane, when brought together and united by breaking joints, and secured by screw bolts, keys, or their equivalents, so that the junctions of the sections of one part shall be in the middle, or near the middle, of the sections of the other part.

"And I also claim making a recess or groove at the junction of the two parts of the rail at the top, that the iron, when beaten down by the action of the wheels of railroad trains, may spread therein, without having a tendency to force apart the two halves, and strain the securing bolts or keys."

21. For an *Improvement in Regulating Forebays;* Henry Mallow, Upper Tract, Pendleton county, Virginia, March 13.

The patentee says,—"The nature of my invention is such as to regulate the flow of water to two or more water wheels, receiving their water from the same forebay."

Claim.—"What I claim as my invention, is the method of regulating the supply of water from one and the same forebay, to different water wheels, or other movers of machinery driven by water, by means of a partition or partitions, over which water not required for the steady action of one wheel, or series of wheels, may pass to one or more other wheels, which do not require constant and invariable supplies.

"I also claim the use of the above manner of regulating the water of a forebay by partitions, in combination with one or more swinging gates attached to said partitions, so adjustable as to regulate, change, or reverse the course of the current of water, and also in combination with the regulating waste gates."

22. For an *Improvement in Spring Shanks for Boots and Shoes;* John McGinley, Philadelphia, Pennsylvania, March 13.

Claim.—"What I claim as my invention, is the position of the slot and sliding part of the spring shank within the boot or shoe heel, for the purpose of being protected from injury."

23. For an *Improvement in Balances for Weighing;* Maria L. Eastman, assignee of Robert Eastman, Concord, Merrimack county, New Hampshire, March 13.

Claim.—"What I claim as my invention, is the improvement or combination as applied to a scale beam, and composed of the following elements or their mechanical equivalents, viz., 1st, the suspended platform; 2d, the series of one, two, or more weights; 3d, a lowering and lifting apparatus, the same consisting of the cone, slide bar, and catch; the whole combined and made to operate together as described. And, in combination with the said lifting and lowering apparatus, I claim the scale of figures on the slide bar, and the hole made through the post, or their equivalents."

24. For an *Improvement in Cotton Presses;* William J. Johnson, Mobile, Alabama, March 13.

Claim.—"What I claim is, 1st, the combination and arrangement of the circular revolving platform and radial presses, for conveying uncompressed bales of cotton or other substances to the steam cylinder, to be compressed, simultaneously with the operation of conveying compressed bales from the cylinder, to be tied; by which all the hands attending the various parts of the machine are kept constantly employed during the operation of the steam engine, whether the revolving circular platform be made, arranged, and operated in the manner herein described, or other mode which may be substantially the same.

"2d, I claim the combination and arrangement of the jointed arms, levers, slotted arms, and triangular plates, as connected with the follower and head block, for preventing the descent of the follower, when detached from the lifting hooks of the steam engine, before the ropes are tied.

"3d, I claim the mode of conveying the ropes for tieing the bales through the grooves of the head and tail blocks, by means of the conveyors, during the operation of compressing a bale, simultaneously with the ascent of the follower, and then returning the conveyors to their original positions, simultaneously with the descent of the said follower, by means of the combination of the conveyors, rollers, and cords attached to the same.

"4th, I claim the manner of employing the four upright pillars, with shoulders, in combination with the head block, follower, and circular revolving platform, said pillars being arranged and operating in the manner described, for the purpose of supporting the head block in such manner that it can accommodate itself to the position of the pendant head block during the operation of compressing, without deranging or straining the platform, said pillars playing loosely in boxes let into the platform on which the shoulders rest whilst adjusting the bale for compressing."

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25. For *Improvements in Rope Machinery;* Benjamin Morison, Harrisburg, Dauphin county, Pennsylvania, March 13.

The patentee says,—"The nature of my invention consists in placing the revolving reels, which contain the yarns, at an inclination towards each other at their upper ends, and causing them to revolve upon their axes by means of a bevel pinion secured upon each reel, near its upper end, and working within, or on the inner and under side of a concave stationary bevel wheel, whilst they are being carried round in a contrary direction by the vertical revolving shaft and projecting arms upon which the reels are secured; in providing each of the reels with a changeable tube, adjustable plate, and press block; in the substitution of a sliding spring nipper; in the peculiar manner of constructing the reel, and in the substitution of different sized drawing wheels, with grooved projections, in place of a grooved roller and change wheels, for drawing the various sizes of rope through the machine."

Claim.—"What I claim as my invention, is, 1st, the placing each reel at such an inclination towards the point of 'laying' or combination, as that its whole axis shall be in a direct line with its strand after it leaves the tube and is beginning to be combined, and so that the tubes of the respective reels shall be almost in contact at their upper ends, just immediately below the nipper blocks, the tube on each reel being a part, and a direct continuation, of the axis of its respective reel.

"2d, I claim the placing of the reels also at a suitable angle of inclination from the right or left of the rope, so that the strand, as drawn out of each tube, has a direction towards the outside of the rope, viz., should a right line be drawn lengthwise through the centre or axis of either reel and continued, it would be in the centre of the strand also, onward to that side of the rope upon which it is being laid, and from which the tube recedes when carried round upon the vertical shaft.

"3d, I claim the use of a concave stationary driving wheel, connecting with the reels by pinions above the bobbins, for giving the necessary counter motion to each reel, as they are carried round by the vertical or main shaft.

"4th, I claim the two thumb screws and elastic levers, in combination with the tubes, arranged as above described, for giving the nipper blocks a more steady and regular pressure or grasp upon the rope.

"5th, I claim the application of the adjusting plate between the press block and tube, the same being secured by means of the mortise or opening through the shaft, and the grooves therein, within which it is made to slide as described."

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26. For an *Improvement in Cooking Stoves;* George E. Waring, Stamford, Fairfield county, Connecticut, March 13.

Claim.—"What I claim as my invention, is extending the hot air chamber under the fire grate, when the top plate thereof is so inclined or curved as to discharge the ashes that fall thereon from the grate, that the said air chamber may be heated by a radiation from the fire on the grate above.

"I also claim making the hot air chamber in two compartments, by a partition perforated at or near the middle of its length, in combination with the perforations in the back plate of the back chamber or front of the oven, and near the ends thereof, that the air which enters the chamber through holes in the side of the stove, may be forced to circulate through the hot air chamber, to be heated before it enters the oven near the sides thereof.

"And finally, I claim, in combination with the method of heating the top of the air chamber, the extension of the bottom flues of the stove, that the products of combustion, in passing around to enter the return flue, may pass under the bottom plate of the hot air chamber, and thus aid in heating the air therein."

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27. For an *Improvement in Curry Combs;* Andrew Hotchkiss, Sharon, Litchfield county, Connecticut, March 13.

Claim.—"What I claim as my invention, is the mode of making curry combs, by constructing their body and teeth out of one solid sheet or piece of metal, by so cutting and bending the said sheet or piece of metal, that, without any material waste, and without the combining and riveting or fastening together separate and detached portions of the structure, I do make a complete body and teeth for the comb. I also claim the entire form and combination of the parts, to form such a comb as is described and illustrated in and by the said specification and drawings."

28. For an *Improvement in Ploughs;* William T. Sprouse, Petersburg, Menard county, Illinois, March 13.

The patentee says,—"The nature and object of my invention is to so construct a plough, that a farmer can keep it in perfect repair for a great length of time, himself, without requiring the services of a blacksmith."

Claim.—"What I claim as my invention, is the constructing the share and point of my improved plough of a diamond-shaped flat plate of metal, placed under the mould-board and combined therewith, and with the flanch and standard, (of the casting,) in such a manner that the share plate can be moved forwards to a proper position, as its operating point or share edge wears away by use, without producing the slightest change in the form or position of the winding concave face of the mould-board."

29. For an *Improved Furnace for Smelting Zinc;* Seth Boyden, Newark, Essex county, New Jersey, March 13.

The patentee says,—"The nature of my invention consists in a double retort, surrounding the fire with the ore, so that the heat has but little chance to escape, except through the ore or object to be heated."

Claim.—"What I claim as my invention, is a combination or double retort or furnace, generating the heat within the vessel or chamber containing the ore to be heated, surrounding the fire chamber or place of combustion with the ore, so that the caloric going off in any direction from the fire, (except down through the grate,) must pass through the ore. With this arrangement merchantable metallic zinc is obtained from the ore, in the proportion of one ton of zinc by four and one-fourth tons of coal."

30. For an *Improvement in Curry Combs;* William Beach, Philadelphia, Pennsylvania, March 13.

Claim.—"What I claim as my invention, is the shank constructed with the fastening hole therein, made without drilling or welding, and combined with the comb, so as to act as guards to the ends thereof."

31. For an *Improvement in Smoke-Consuming Apparatus;* F. P. Dimpfel, Philadelphia, Pennsylvania, March 13.

Claim.—"What I claim as my invention, is, 1st, combining with the blowing wheel, which forces the blast into the furnace, and which receives a portion of the products of combustion from the furnace, an auxilliary blower or blowers, to insure the requisite supply of atmospheric air to the main blowing wheel.

"2d, I claim connecting and combining the damper that governs the blast pipe with the dampers that govern the apertures through which the products of combustion enter the fan blower.

"And lastly, I claim making the case that contains the gravel or other impeding medium, of a double cylinder or prism of wire gauze, or the equivalent thereof, when this is so combined with the chimney as to prevent the escape of the products of combustion, except through the interstices of the said impeding medium."

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32. For an *Improvement in Grain Gatherers;* William Herries, Fayette, Seneca county, New York, March 13.

Claim.—"What I claim as new, is the application and use of the foot lever, acting through the hinges to give a motion to the fingers or teeth, independent of the motion of the handles, for the purpose of throwing the grain into a position over the handles and arms, whereon it may be readily bound into bundles."

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33. For an *Improved Door Lock;* Sylvester M. Pye, Aquackhanock, Passaic county, New Jersey, March 13.

The patentee says,—"My improvement consists, 1st, in constructing the talons, (to be operated upon by the large key,) so as to avoid the introduction of the elevating slide No. 4 of my previous lock. 2d, In the introduction of what I call an extension lever, which, when in certain positions, prevents any one on the outside from throwing the bolt or latch. 3d, In the introduction of a movable plate or arm, which, being brought over the keyhole on the face of the cap of the lock, interposes an effectual barrier to the insertion of a key or picks from the outside of the door."

Claim.—"What I claim as my invention, is, 1st, the talons as constructed on the end of the lever 2, herein described, by means of which, and the connecting tumbler when acted upon by the key, the fallers are prevented from acting upon the bolt.

"2d, The interposition of a metallic plate over the keyhole, in the manner represented, in combination with the lever 5, the spring upon it, and the notches in the rim of the lock.

"3d, The pin of the night latch, constructed so as to revolve in its socket."

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34. For an *Improvement in Planing Machines;* Daniel Barnum, (as joint inventor with, and assignee of, Thomas J. Wells,) City of New York, March 13.

Claim.—"What we claim as our invention, is the combination, arrangement, and construction of the double cams, the eccentric clamps, and the rockers, for the purpose of producing an uniform, continuous, and parallel feed motion, without rollers, rack and pinions, endless chains, or any common device, by which means we produce a parallel feed motion, without the expense and friction of ways or slides, whether applied to planing machines or for any other purpose.

"Also, the construction of the fence, or any analogous device, against which to spring or curve a board to be planed, in combination with screw clamps or gauges with proper contrivances, or other means adapted to the curve on the fence, extending each way from the centre of the curve and disk, embracing each line of the fence as far as may be necessary, for the purpose of receiving the board or plank, by clamping or otherwise acting upon the edges, while it is on the front line of the fence, holding and directing it around the curve, springing and presenting each portion of the board successively to the action of the finishers on the disk, on a curve, and also preventing the finishing portion of the surface from coming in contact with the knives on the back part of the disk, as it passes out of the machine on the rear line of the fence.

"Also, the combination of the armed fence and gauges, or any other device for springing or presenting a board or plank, on a curve, to the action of planes or finishers on a disk, with the disk and long or broad finishers, to extend across the board the entire width, and at right angles with the shaft, for the purpose of planing boards and plank when presented on a curve, thereby finishing them while cutting with the grain, and leaving no circular marks or scores across the board or plank.

"The effects of these improvements are, the production of a new parallel feed motion, without the friction and expense of ways or slides, and also a new method or principle of presenting a board or plank to the action of the knives or finishers, revolving on a disk, on a curve; by which means the finished surface is made while the finishers are cutting with the grain of the wood, thus converting the disk or Bramah wheel, which has hitherto been comparatively of little worth, into a most useful and valuable machine. The tendency of the planing operation with the disk is to move the board edgewise, in the same plane in which the knives revolve, in contradistinction to the Woodworth cylinder, which tends to lift the boards directly up from its bed, as it cuts up and out, from the reduced or planed to the unplaned surface."

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35. For an *Improvement in Looms for Weaving Brussels Carpeting, &c.;* Erastus B. Bigelow, Boston, Massachusetts, March 13.

The patentee says,—"My improvements consist in operating the lathe of the loom, in combination with the trough or grooved bar employed to carry the wires under the warps, in such a manner as to effect the operation of 'clearing the shed.' "

Claim.—"What I claim as new, is, 1st, the moving the trough or grooved bar forwards towards the face of the cloth, when between the warps, for clearing the shed, in the manner above described.

"2d, I claim the said trough or grooved bar, in combination with the lathe of the loom, whether the said lathe be constructed with two pairs of swords, as above described, or in any other way which shall give to the race beam a counter motion, or move the said trough or grooved bar forward between the warps."

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36. For an *Improved Spiral Spark Arrester;* Andrew M'Cleary, Philadelphia, Pennsylvania, March 13.

Claim.—"What I claim as my invention, is the combination of the chamber, containing the wings (c') and wings (h), with the openings and volutes, by means of which I am enabled to make sufficient eddies, and throw down the sparks more perfectly than by any other arrangement with which I am acquainted."

37. For *Improvements in Apparatus for Dressing Cloth;* John Johnston and John D. Snyder, Saltsburg, Indiana county, Pennsylvania, March 13.

Claim.—"What we claim as our invention, is the combination of the rotary brushes, shears, steaming apparatus, polishing velvet roller, and other parts, as herein described, with the polished convex metallic rubbers, whereby all parts of the process of finishing a piece of cloth, after it leaves the fulling mill, are simultaneously and continuously performed."

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38. For an *Improvement in Cotton Batting;* Hamilton B. Lawton, Cohoes, Albany county, and Hiram T. Lawton, Troy, New York, March 13.

Claim.—"What we claim as our invention and discovery, is the method of laying on and covering the entire upper and lower surfaces of cotton batting, that has been merely well picked and spread in a lapper, with a thin sheet or layer of carded cotton, for the purpose of making it smooth and strong, thereby fitting it for being packed and pressed, and used for batting purposes, such as beds, mattrasses, &c."

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39. For an *Improvement in Apparatus for Raising and Tilting Water Buckets;* Henry W. Sabin, Reed's Corner, Ontario county, and Luther B. Benton, Penn Yan, Yates county, New York, March 13.

Claim.—"What we claim as our invention, is the combination of the vibrating arms with the cog wheels of the crank shaft, in such a manner that, by the lengthwise movement of the crank shaft, one of the arms is thrown into, and retained in, a horizontal position, for bearing against the rope of the ascending bucket, to steady the same; and also in combination with the strap, by which the bucket is conneted with its rope, serving to turn and guide the bucket so that it will be caught and capsized by the tilting bar."

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40. For an *Improvement in Apparatus for Raising Water;* William T. Barnes, Buffalo, New York, March 20.

Claim.—"What I claim, is raising water by centrifugal force, produced by a combination of inclined planes and fans attached to a shaft, as herein described, using any combination of inclined planes or fans to produce the intended effect."

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41. For an *Improvement in Apparatus for Drawing Water from Wells;* Jehiel T. Farrand, Port Bryon, Cayuga county, New York, March 20.

Claim.—"What I claim as my invention, is the mounting the driving pinion, and the auxiliary reversing pinion which is geared thereto, in bearings rising from the vibrating tumbler; which tumbler is combined with, and operated upon by, the inclined planes rising from the sliding bar, through the medium of a lever."

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42. For an *Improvement in Tide Water Wheels;* Freeman F. Myrick, Lynn, Essex county, Massachusetts, March 20.

Claim.—"What I claim as my invention, is the arrangement of the shaft in an inclined position, so that while the buckets of the water wheel dip in the water on one side of the wheel, those of the other side become elevated above the surface, in combination with the water wheel, and with the horizontal revolving platform, whereby the position of the water wheel is occasionally changed without disconnecting the gear wheel from the wheel or pinion."

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43. For an *Improvement in Steelyards for Weighing;* Tilley Flint, Westford, and Warren Flint, Chelmsford, Middlesex county, Massachusetts, March 20.

Claim.—"The combination we claim and consider as our invention consists as follows: 1st, the steelyard and scale pan, or any equivalent or equivalents therefor; 2d, the auxiliary scale on the short arm of the steelyard; 3d, the movable bar or its equivalent; 4th, the balancing lever and stirrup of the scale pan; the whole being made to operate together, by means of weights, substantially in the manner and for the purpose specified."

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44. For an *Improvement in Planing Machines;* Daniel Barnum, (as assignee of Thomas J. Wells,) City of New York, March 20.

Claim.—"What I claim as my invention, is the application to the face disk of one or more long or broad plane irons or finishers, embracing the whole width of the board, the inner ends or edges of which being slightly elevated, and which, in their rotations, form or generate a slight cone, in combination with the jacking tools, or of gauges placed upon the periphery, for the purpose of producing a two-fold action: that is, the slight conical cut of the finishers and the perfect disk operation of the jacking tools; thus uniting and claiming the action of the cone and the disk in one and the same planing wheel. I thus produce the effect of the Bramah gauges, in chipping or hewing away the roughest part, the jacking tools revolving in the perfect plane of the disk; and also the effect of the cone, by the slight elevation of the finishers on the end near the shaft; which effect is to finish the surface while the finishers are cutting with the grain of the wood, the shaft being slightly inclined to correspond with the elevation of the knives or finishers. The finishing is thus done with the grain and having no circular mark across the board, and in contradistinction to the finishing operation as was performed by Bramah, his finishers cutting in circular scores across from one edge to the other of the board, leaving the surface indented with them and unfit for use, while I produce a perfectly level and smooth surface, substantially as described and shown."

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45. For a *Machine for Making Percussion Caps;* Richard M. Bouton, West Troy, Albany county, New York, March 20.

Claim.—"What I claim as my invention, is the combination and arrangement of the mechanism above described, for producing the combined operation fully set forth, of feeding the metallic ribbon to the star die, punching the blank from the ribbon, transferring the blank to the forming die by the transferring apparatus, punching the blank into the forming die and forming it into a cap, and discharging the same from the die by the elevator, and kicking the cap in a finished state from the die bed by the driver; all of said operations being performed successively at every revolution of the crank and cam arbor to which the propelling power is applied, substantially as described.

"2d, I also claim the transferring apparatus, constructed as described, in combination with the punches."

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46. For *Improvements in Carding Machines;* Thomas G. Boone, Brooklyn, New York, March 20.

Claim.—"1st, I claim the weighted roller, in conbination with the feed rollers and the lap cylinder, for the purpose of drawing in cotton, and feeding it to the licker-in in a thinner sheet than is done by carding machines at present in use.

"2d, I claim the aperture and chamber in the casing at (*t*), where the casing projects in near to where the main cylinder card, at its lowest surface, takes the staple from the top or upper surface of the licker-in card, near to such aperture and chamber, as described, and also provided in the casing. And I do claim them, also, in combination with the peculiar placing of such main cylinder directly over the licker-in, so as to bring their place of nearest proximity and action exactly, or nearly, over the centre of the licker-in, and as near to such aperture and chamber as it may safely be placed, in order to discharge such dirt and silicious impurities as may be disengaged by such action, and throwing it through such aperture by the combined motion of both cylinders, without allowing it to fall, either into the cards again, or on to the lap or mat of cotton entering them.

"3d, I claim the arrangement and action of a reducing doffer as my own invention, the same having no action with the main cylinder, but with the doffer, whereby I collect the fibre from the common doffer, though but sparsely scattered thereon, into a thicker sheet or mat, more suitable for a proper delivery by the comb, or other apparatus for stripping or clearing the same. And I claim the same, whether operated by using two such reducing doffers in combination, or by using one only, or in any other way that is substantially the same in principle and effect, in order to collect the staple from a common doffer into a thicker mat, to be taken off by a comb or other stripper.

"4th, I claim a card roller, or top clearing cylinder, moving the impurities disengaged by its lower surface from the main cylinder, on its edge in a direction contrary to the edge and action of the main cylinder, and calculated to take it out from the place of contact without pressing it between itself and the main cylinder, in combination with a beater or stripper, revolving in a manner to clear the same, and deposit the strippings as described."

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47. For an *Improvement in Cooking Ranges;* John M. Dearborn, Boston, Massachusetts, March 20.

Claim.—"What I claim, is the combination of the auxiliary heating chamber, and secondary fire place and flue, with the main fire place specified, the said secondary fire place being made to receive its air from its side, and through the main fire place."

48. For an *Improvement in Draining and Blanching Sugars;* John Spangenberg, Jefferson parish, Louisiana, March 20; (anté dated September 20, 1848.)

Claim.—"What I claim as my invention, is the method of bleaching and draining brown sugars on the plantation, as herein set forth: that is to say, blanching the sugar by a solution of molasses and water, both being in the cold state, and the operation being performed in the hogshead destined for the transportation of the sugar to market, thereby increasing the value of the sugar without a corresponding increase of expense."

49. For an *Improvement in Processes for Burnishing Metals;* Edward Satterlee, Albany, New York, March 20.

The patentee says,—"The nature of my invention consists in covering the surface of the metal or stone to be gilded, with a coating which possesses the properties of adhering firmly thereto, while it readily receives, and strongly retains, the gilder's materials or preparations, and possesses all the firmness requisite to permit the free use of the burnishing tools."

Claim.—"What I claim as my invention, is the mode herein described, of preparing surfaces of cast or wrought iron, or other metals, and stone, so that they may be gilded or silvered in the same manner as wood, and burnished with equal facility, viz., by applying thereto the preparations of shellac and yellow ochre, or other similar and suitable earthy or mineral substance."

50. For an *Improvement in Portable Hot Air Furnaces;* John P. Hayes, Boston, Massachusetts, March 20.

Claim.—"What I claim as my invention, is the combination of four or more horizontal and parallel smoke flues or chambers, each connected with the one next above it, alternately at the front and then at the rear of the furnace, and the top plate of each chamber having, for the purpose, an opening to establish the connexion with the two exterior diving cold air flues and the central hot air chamber."

51. For a *Bell Telegraph;* Lucretia Houghton, administratrix of Harvey Houghton, Truxton, Cortlandt county, New York, March 20.

Claim.—"What I claim as my invention, is the combination of the turning tablets with the wires, springs, and levers for turning them, arranged in the manner and for the purpose set forth."

52. For an *Improvement in Magnetic Telegraphs;* Caleb Winegar, Springport, Cayuga county, New York, March 20.

Claim.—"What I claim as my invention, is moving the paper, on which telegraphic marks are made, into and out of contact with a stationary pen, by which means I avoid the danger of dispersing the ink, which happens when the pen is rapidly agitated, and also gain the advantage of supplying the ink, while the telegraph is in action, to a pen wholly at rest.

"I also claim operating the magnet which effects the movement of the paper, directly through the main telegraphic circuit, thereby dispensing with the secondary or receiving magnet and local battery.

"I also claim the arrangement for conveying ink to the stationary pen of a marking magnetic telegraph, by means of an adjustable feeder, regulated to correspond in its action with the rate of motion given to the strip of paper on which the telegraphic marks are to be made.

"I also claim the horizontal adjustable supporting stand, in combination with the stationary pen axis, the paper carrier and its adjusting screw, and with the vibrating lever, when employed to adjust the direction of motion of the paper, and allow the marks to be made along its central line."

53. For an *Improvement in Cotton Cultivators;* Samuel W. Akin, Maury county, Tennessee, March 20.

Claim.—"What I claim as my invention, is, 1st, the grooved board fitted to the scraper and bolted to the beam, for the purpose of protecting the plants from falling clods of earth; and, 2d, in the arrangement of teeth in one beam of the cultivator, and constructing them of different lengths."

54. For an *Improvement in Air Heating Furnaces;* Oliver Tiffany, City of New York, March 20.

The patentee says,—"The improvement consists in the increased economizing of the heat of the fire that it accomplishes, by the manner of enveloping it in the air to be heated; and in the greater ventilation, at any given temperature of the air, it gives to the rooms warmed, green houses, or kilns; and in the machine-like precision with which it regulates the quantity and temperature of the air heated, and of that which ventilates the rooms."

Claim.—"What I claim, is the manner in which I arrange the furnace, smoke pipe, and air heating spaces, as set forth: that is to say, I claim placing the furnace at or near the centre of the spiral flues and air spaces, the furnace being surrounded on all sides except the back and front.

"I also claim the manner of arranging the valve, in combination with the three flues, for the purposes of heating and ventilation."

55. For a *Self-Adjusting Railroad Switch;* Erastus C. Matthewson, Hartford, Connecticut, March 20.

The patentee says,—"My improvement consists in so constructing and arranging the parts of the apparatus, and so connecting it with the switch, that, by simply depressing a lever attached to the locomotive or other car, that pries down a rod or other projection, so as to come in contact with a bar supported in an oblique direction with the track; and, by means of this bar being connected with the apparatus that moves the switch, the switch will be moved with perfect accuracy and certainty, if it be not already in the right position, in which case it will not touch the bar."

Claim.—"What I claim as my invention, is the combination of the triangle with the wheel, the detent, the lever and the bars *l* and O, when connected by the bars *d* and *d'*, and the triangle connected with the bars D and E by the bar K, and the wheel connected with the switch by the bar F, or other analogous device, and the corresponding parts, marked D′, E′, &c., when the train is passing in the opposite direction."

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56. For an *Improved Spring Snap Hook;* Job Johnson, Brooklyn, New York, March 20.

Claim.—"What I claim as new, is the sliding springs with points turning outwards, with or without barbs, in combination with the single spring and hook, or the double spring with hooks, or with the barbed lance."

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57. For an *Improvement in the Manufacture of Paper Veneers;* Charles Walker, Chester, and George Wilson, Weathersfield, Windsor county, Vermont, March 20.

The patentees say,—"The nature of our invention, consists in taking the impression of all kinds of wood upon papar, which, by means of glue or any other adhesive substance, can be placed upon all kinds of wood work."

Claim.—"What we claim as our invention, is the application and use of the type and ink, for the purpose of manufacturing paper veneer, and making an application of it to the purposes herein designated."

After the application of the paper veneer to the work, it is finished by the use of varnish.

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58. For an *Adjustable Cut-Off;* Julius King, Bordentown, Burlington county, New Jersey, March 20.

The patentee says,—"The nature of my invention and improvements consists in so constructing and arranging the levers which lift the valves, and the cams and other apparatus which operate them, that they will open the steam valves, and then close them again, to cut off the steam, when the piston has accomplished any definite portion of its stroke, the feet of the lifting levers being susceptible of such adjustment as will vary the point at which the steam is cut off at pleasure, without either stopping the engine or changing the lead of either the steam or exhaust valves."

Claim.—"What I claim as my invention, is raising the valves by means of the tappets of a revolving shaft, acting against the adjustable sliding or horizontal vibrating levers which raise the valves, whereby the steam can be cut off at any point in the stroke of the piston that may be desired, and the points of cutting it off changed from time to time without stopping the engine.

"I likewise claim reversing the motion of the engine, by means of the clutch-coupling, arranged and operated as herein set forth, and also, by the same means, throwing the cam which operates the valves out of gear, when it is required to work them by hand."

59. For an *Improved Sliding Wrench;* William A. Dodge, assignee of Dexter H. Chamberlain, Boston, Massachusetts, March 20.

Claim,—"What I claim as my invention, is a wrench in which the sliding jaw is moved by two segments of a cylinder, connected with said jaw as set forth, and having screws on their upper ends engaging with the screw on the interior of the hollow cylindrical handle."

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60. For an *Improvement in Planing Machines;* Joseph P. Woodbury, Boston, Massachusetts, March 20; (anté dated September 20, 1848.)

Claim.—"What I claim as new, is, 1st, the combination of endless platforms or bands, as described, above and below the plank, and geared together so as to be forced to move in one direction and with the same velocity, said top platform being held down upon the board by means of the links, with a force varying with the resistance of the cutters, for the purpose of forcing the plank through under the stationary cutters, when used in combination with said stationary cutters.

"2d, I claim the stationary cutters, in combination with the yielding bar mouth pieces.

"3d, I claim the adjustable edge rollers, in combination with the tongueing and grooving cutters, or other stationary edging cutters."

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61. For an *Improvement in Gas Burners;* Daniel H. Solliday, Philadelphia, Pennsylvania, March 20; (anté dated January 9, 1849.)

The patentee says,—"The nature of my invention consists in applying a tube band or ring, or other similar body, near to the orifice of the gas burner, which, by altering the shape or thickness of the flame, and the discharge or force of the stream of gas escaping from the burner, shall increase the light caused by the consumption, out of the same, of any given quantity of gas."

Claim.—"What I claim as my invention, is, in the first place, the application to gas burners of a ring, band, or tube, of any kind, movable or stationary, or made with the said burner out of the same piece, for the purpose of increasing the light, by altering the shape, direction, or force of the stream of gas escaping from a gas burner of any construction whatever.

"I also claim, in the second place, the application of notches to the upper edge of the tube, for the purpose of giving shape or brilliancy to the flame resulting from the combustion of gas from burners to which a tube, band, or other similar body has been applied.

"I also claim, in the third place, the mode of regulating the flame of gas burners having a band, tube, ring, or suitable body, namely, by raising and lowering said tube, band, ring, or other suitable body, by means of a nut and screw, (or slide,) or by any other known means of changing the relative position of the edge of the tube, and the nipple of any kind of gas burner to which my invention may be applied."

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62. For an *Improvement in Hanging Carriage Bodies;* Israel Jackson, West Grove, Chester county, Pennsylvania, March 20.

Claim.—"What I claim as my invention, is the arrangement of a cross or disk, attached by a pivot to the perch of a spring vehicle, combined with inflexible rods or braces, attached to the body of the carriage, and so disposed on the extremities of the cross, or periphery of the disk, that the oblique action which they produce on one side shall counteract that which they produce on the other; and I claim the application of this my invention, as well to railroad cars and trucks, as to vehicles running on common roads."

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63. For an *Improvement in Surgical Apparatus for Fractured or Injured Ankles;* George W. Yerger, Philadelphia, Pennsylvania, March 20.

The patentee says,—"The nature of my invention consists in securing to the shank and heel of the boot, designed for the fractured or otherwise injured limb, a series of curved, and spring, and jointed bars, corresponding in form, as near as possible, with the parts of the boot to which they are contiguous, extending over the front part and instep, and upward behind, and on the sides of the ankle of the boot, and on the sides of the calf of the leg of the wearer, and attached at this last mentioned part to a pad, corresponding with the form of the calf of the said leg, in such a manner as to cause the weight of the body of the wearer to rest entirely on the lower part of the calf of the leg, and relieve the ankle of all pressure."

Claim.—"What I claim as my invention, is the mode of supporting the ankle when fractured or otherwise injured, at the same time allowing a flexible movement to the same, by means of the before described combination of spring bars and movable stops, shank plates, curved, jointed, and oval bars, and pad or bandage, as described."

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64. For an *Improvement in Springs for Carriages, &c.;* David R. Pratt, Worcester, Worcester county, Massachusetts, March 20.

Claim.—"What I claim as my invention, is the mode of making india rubber springs for carriages and other purposes, by which the several endless elastic belts are successively brought into action as the load is increased, by means of the combination of the concentric endless elastic belts and concentric rows of pins, or their equivalents, the concentric segment rings being connected to the plates attached to the body and running gear of carriages."

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65. For an *Improved Machine for Turning a Lock on Sheet Metal;* Francis Leonard and Daniel Hughes, assignees of John Wright, Rochester, New York, March 20.

Claim.—"What I claim as my invention, is the combination of the bed piece, the tumbler, the folding slide, and lever, for the purpose of turning a lock on sheet iron or other metals."

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66. For *Improved Conical Valve Tuyeres;* Robt. D. Porter, Harper's Ferry, Jefferson county, Virginia, March 27.

Claim.—"What I claim as new, is the giving the movable valve the form of a cone, for the purpose of facilitating the discharge of the ashes and cinders into the air box and ash pit, and for protecting the valve from being injured by the fire."

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67. For an *Improved Feeder and Nippers for Screw-Cutting Machinery;* William Van Anden, Trenton, New Jersey, March 27.

The patentee says,—"The nature of my invention consists in the construction of a machine for the purpose of cutting or chasing the threads upon bolts or blanks, as they are termed, by means of which they are turned into screws of various kinds."

Claim.—"What I claim as my invention, is, 1st, the permanent vertical feeding tube or shaft, extending from the top of the frame down to a point near the grippers, in combination with the revolving tube and grippers, whereby I am enabled to feed the blanks directly through the said tube on the grippers, without imparting rotary motion to them until they reach the jaws of the grippers, thereby insuring perfect regularity in the feed.

"2d, I claim the peculiar construction of the grippers, in respect to the double action of the jaws, whereby but one screw blank can enter, be held, and discharged at a time, although a series of the said blanks may fill the entire length of the stationary feeding tube."

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68. For an *Improvement in the Clarification of Cane Juices;* John Spangenberg, Jefferson parish, Louisiana, March 27.

The patentee says,—"The nature of my invention, and the great advantage it has over the old methods are as follows: In the first place, it consists in having a greater number of juice boxes, or, otherwise, a number of boxes containing a greater quantity of juice, so that the juice may have more time to deposit its impurities and extraneous matter. Secondly, that, by thus having the juice clarified, or its impurities deposited in the several boxes before it is drawn into the 'grand,' the operation of making the sugar is commenced in the kettles with a hot clarified juice. Thirdly, I use the escape steam for clarifying, although the steam direct from the boiler may be used."

Claim.—"What I claim as my invention and discovery, is, 1st, the direct application of steam, by injection, to the sugar cane juice, whilst in the vats, and before being transferred to the 'grand,' for the purpose of speedily heating, clarifying, defecating, purifying, and freeing the juice of the feculent and other extraneous, injurious, and impure matter, as set forth."

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69. For an *Improvement in Printing Floor Oil Cloth;* Nathaniel B. Powers, Lansingburg, Rensselaer county, New York, March 27.

Claim.—"What I claim as my invention, is the employment of the combination of the gauge and stops, for guiding the printing block without the use of the pitch pins, during the operation of stamping the colors on the cloth, by which the work is rendered much more accurate, and is executed with greater dispatch, and is not so liable to become blurred during the operation of handling the blocks, nor of having the colors to overlap by a misplacement of the blocks."

70. For a *Combined Convex and Concave Auger;* Nathaniel C. Sanford, Meriden, New Haven county, Connecticut, March 27.

Claim.—"What I claim as my invention, is forming the lower part of the plate, from which an augur is to be formed, of a convex shape or even thickness, when this is combined with the upper part of the plate formed of a concave shape; the whole plate being formed for the purpose of making therefrom a double-lipped convex and concave auger."

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71. For an *Improvement in Cooking Stoves;* William E. Bleecker, Albany, New York, March 27.

Claim.—"What I claim as my invention, is the oblique plate under the forward part of the bottom of the oven, when this is combined with the air chamber formed by the oblique plate and the forward part of the bottom oven plate of a cooking stove."

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72. For an *Improvement in Piano Fortes;* James A. Gray, Albany, New York, March 27; (anté dated September 27, 1848.)

Claim.—"I claim the application of weight or pressure upon the sounding board of the piano forte, either directly or upon the crooked bridge thereof, as the most convenient mode of applying the same, for the purpose of producing a change in the tone of the instrument, thereby extending its musical capabilities."

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73. For a *Combination of Adjustable Saddle and Winch;* Abraham G. Polhameus, Nyack, Rockland county, New York, March 27.

The patentee says,—"The nature of my invention consists in the making of a saddle to completely surround the mast of a ship or other vessel, and clasped or hooped together by means of a strong iron band, the ends of which pass through the front half of the saddle board, and are secured by means of strong screw nuts."

Claim.—"What I claim as my invention, is the combination of a winch with a movable and adjustable saddle, connected so that the winch moves with the saddle."

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74. For an *Improvement in Self-Acting Cheese Presses;* Benjamin M. Otis, Cleveland, Cayuhoga county, Ohio, March 27.

The patentee says,—"The nature of my invention consists in the arrangement of two levers, in connexion with certain wheels, in such a manner that a continual and constantly increasing pressure is produced simply by the gravity or weight of the substance to be pressed."

Claim.—"What I claim as my invention, is the combination and arrangement of two levers with their corresponding pairs of pulleys, having cords passing around them to their respective barrels."

75. For *Improvements in Adjusting the Position of Plane Irons, and Regulating the Throats of Planes;* Emanuel W. Carpenter, Lancaster, Lancaster county, Pennsylvania, March 27.

Claim.—"What I claim as my invention, is the regulation of the mouth in planes, so as to enlarge and diminish the same, and for the preservation of a close mouth in planes, by a wedge or bit being placed under the bit and fastened by a screw."

76. For an *Improved Sash Stopper;* William E. Arnold, Rochester, New York, March 27.

The patentee says,—"The nature of my invention consists in providing a case made of sheet iron or brass, of sufficient size to receive a bolt, in and through which the bolt moves; the shape of the bolt is such that it moves forward by its own weight; the case containing the bolt is applied to the sash by means of a mortise through the sash stile."

Claim.—"What I claim as my invention, is the combination of the case and bolt, for the purpose of holding the sash up or down."

77. For an *Improvement in Corn Shellers;* Johnston Small, Bridgewater, Beaver county, Pennsylvania, March 27.

Claim.—"The parts which I claim as my own invention, are the combination of the shute E, cylinder, and shute J, for feeding and shelling the corn, and discharging the cobs."

78. For an *Improvement in Guides for Warpers;* Whiting Hayden, Windham, Windham county, Connecticut, March 27.

Claim.—"What I claim as my invention, is the application of the principle of contraction and expansion to the 'warper guide,' and for the purpose of accomplishing this, I will make use of a metallic coil of wire."

79. For an *Elliptical or Oval Truss Frame for Bridges;* James Barnes, Springfield, Hampden county, Massachusetts, March 27.

The patentee says,—"The invention consists in so constructing the truss that the force of thrust and tension to which it is subjected, shall be brought into such relation to each other as to produce the least tendency to fracture."

Claim.—"What I claim as my invention, is the union of the ordinary chords of a truss frame into one continuous elliptical or oval curve, in which the thrusts and tensions of the truss, so constructed, will operate in the manner set forth."

80. For an *Improvement in Caoutchouc Springs;* Fowler M. Ray, City of New York, March 27.

The patentee says,—"The nature of my invention consists in combining with a spring made of metallic rubber, and in the bore thereof, a helical spring made of metal."

Claim.—"What I claim as my invention, is the combination of helical springs made of metal, with, and placed within, hollow springs made of metallic or vulcanized india rubber, or any equivalent preparation of rubber, whereby the rubber is prevented from spreading laterally, and from chafing against the guide rod, and the tension of the rubber is increased by that of the helical spring."

81. For an *Improvement in Threshing and Grain Separating Machines;* Israel J. Richardson, City of New York, March 27.

The patentee says,—"The nature of my invention consists in combining and arranging a threshing machine, straw carrier, and riddles, fan and screens, in a compact portable form; the straw carrier being of an entirely new construction."

Claim.—"What I claim as new, is, 1st, the straw carrier, consisting of three or more revolving rakes, so arranged as to cause the straw to turn over in its passage out of the machine.

"2d, I claim, in combination therewith, the apron, as above made known. I also claim the elastic teeth placed opposite the revolving rakes, for lightening the straw, combined with the teeth of said revolving rakes. I also claim, in combination with the above named straw carrier, the revolving apron for conveying the grain to the screen.

"Lastly, I claim the movable lower side rails, and roller attached thereto, for the convenience of moving the machine."

82. For an *Improvement in Splint Broom Machines;* John Crum and Abraham Larwill; Ramapo, Rockland county, New York, March 27.

Claim.—"What we claim as our invention, is, 1st, cutting a series of splints on, or from, the surface of a block of wood, with a cutter, by a series of cuts in the direction, or nearly so, of the grain of the wood, in combination with a series of intermittent motions, that the splints may be cut in succession one after another along the entire surface of the block.

"2d, Combining with the cutter that forms the splints on the block, one or more slitting cutters, placed at the required distance from the main cutter, that each splint may be divided into two or more parts towards the point.

"3d, The method of forming the splints thicker at the butt than at the point, by moving the block of wood towards the cutter, or the block and cutter towards each other, substantially as described.

"And finally, The method of making the splints on the block shorter as they approach the centre of the block, by changing the position of the block or the cutter, or the range of motion of the cutter."

83. For an *Improvement in Artificial Manures;* Philip S. and William H. Chappell, Baltimore, Maryland, March 27.

Claim.—"What we claim as our invention, is the residuum from the manufacture of alum, and from the residuum from the manufacture of epsom salts, in composition with any or all of the hereinbefore described materials for the purpose of making the mixture, or a modification thereof, as hereinbefore described, which said composition or mixture is to be made in the way or manner, and to be used as hereinbefore fully set forth."

84. For an *Improvement in Grain Separators;* Daniel Woodbury, Perkinsville, Windsor county, Vermont, March 27.

The patentee says,—"The nature of my invention consists in providing a rack which receives the straw as it is thrown from the thresher, while the grain, by its velocity, mostly passes through, and lodges in, shallow chambers of a revolving web or elevator situated directly below said rack, the elevator having projections or pins corresponding to the rods of the rack, and of sufficient length to carry the straw forward above the rack, to be operated upon by an eccentric revolving toothed roller."

Claim.—"I claim the projections or pins on the elevator, in combination with the rack or slat frame. I also claim the combination of the crank with the toothed roller, to give the latter a traverse or side to side motion."

85. For an *Improvement in Printing Presses;* Jason L. Burdick, Norwich, Chenango county, New York, March 27.

Claim.—"What I claim as new, is, 1st, the manner in which I combine the two cylinders in my printing press with their respective platforms, one immediately above the other, by which each of the cylinders is made to take impressions from the forms on the platform to which it appertains, the lower cylinder perfecting the sheet which has been printed on one side by the upper cylinder and forms.

"I claim the manner of advancing the forms, and of carrying them under the cylinder, by the gearing of the toothed wheels, on the end of said cylinders, into teeth rising up from the edges of the chase or frame in which the form is locked up.

"I claim the manner set forth of constructing the sliding carriages, and of combining them with the platforms, and with the forms sustained thereon; by which construction and combination the form from which an impression has been taken, is made to descend and pass back under the form last elevated, and is itself again elevated and forced forward."

86. For *Improved Machinery for Drilling Rocks;* Joseph J. Couch, Bridgewater, Plymouth county, Massachusetts, March 27.

The patentee says,—"The object of my improvement is to enable a drill to be placed and operated in any desirable direction."

Claim.—"I claim as my invention, the combination of the bars, or any equivalent therefor, the frame and its journals and slide boxes, as constructed, adapted to one another, and made to operate together, for the purpose of supporting the drill, and directing it into any desired position, as specified.

"I also claim a combination made up of the following elements, viz., 1st, Mechanism for throwing or moving the drill forwards, and drawing it backwards, when it is placed in such a position that it would not be advanced by the action of gravity alone, as it has heretofore been made to operate, the said mechanism being the crank shaft, cranks, and connecting rods, directly connected with the slide frame, and the supporting and directing frame, or any well known equivalent machinery, applied to produce similar movements of the drill.

"2d, The griping apparatus, or that by which the drill rod is seized or clamped to the drill frame at the proper times, the same consisting of the bearings or jaws, the wedge, lever, and spring, and its cross-bar directly over said jaws.

"3d, The apparatus which causes the jaws to relax their hold of the drill, and set it free or independent of the drill frame, and so that it may be impelled forwards by its momentum, and suffered to recoil without injury to the rest of the machinery, the same consisting of the cam block and its inclined spring; it being expressly understood that I lay no claim to any combination of machinery, so arranged as merely to lift or draw back a drill, and so that it may act or fall against the substance to be drilled by the power of gravity alone, the invention or improvement claimed by me being a combination of such mechanism, and a mechanism for throwing or impelling the drill independently of the power of gravity, in order that the drill may be placed and operated in any inclined position, as well as in a vertical position."

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87. For an *Improvement in Air Heating Furnaces;* Horace Bushnell, Hartford, Connecticut, March 27.

Claim.—"What I claim, therefore, as my invention, is the arrangement of the air heating flues or spaces, in combination with the descending and ascending draft, so that the air to be heated shall enter and come into contact, first, with the coolest portion of the flue, and issue from the warmest into the air chamber."

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88. For an *Improved Canal Steamboat;* Grenville Parker, Worcester, Worcester county, Massachusetts, March 27.

Claim.—"What I claim, is the combination of the paddle wheel, having inclined buckets, with the wave-queller, whereby the boat is propelled with comparatively little disturbance of the water, or abrasure of the banks of the canal, from the action of the wheel."

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89. For an *Improvement in Spring Lancets;* Joseph Ives, Bristol, Hartford county, Connecticut, March 27.

The patentee says,—"The nature of my invention consists in giving the spring lancet an incisory character, mechanically very similar to that which would be produced by the hand of a skilful surgeon; causing the spring lancet, when thrown suddenly from the case by the action of the main spring, to make the incision in an eccentric curve, to any required length and depth, by means of an oblong slit in the lancet, in combination with a fixed stud in the adjustive carriage, to which the lancet is affixed, and on which it moves."

Claim.—"What I claim as my invention, is causing the point of the lancet to sweep in an eccentric curve, simultaneously with its longitudinal movement in the case, by the combind action of the fixed stud in the carriage and the oblong aperture in the lancet, by which it is made to cut the vein with an oblique draw-knife stroke, avoiding the tendency to rebound in cutting a tough vein or elastic skin, when thrown forward in a straight line at right angles to the vein; the length of the incision being increased or diminished by changing the position of the stud, and its depth by turning the graduating screw of the carriage."

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90. For an *Improvement in Shading Pictures by Metallic Leaves;* Emanuel Hannon, Cleveland, Cayuhoga county, Ohio, March 27.

Claim.—"What I claim as my discovery, is the shading of gilded pictures by metallic leaves, and by the process described."

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91. For an *Improvement in Dyeing;* Samuel Mallerd, Staten Island, Richmond county, New York, March 27.

The patentee says,—"The nature of my invention consists in preparing and using dyes for the purpose of dying fabrics in a raw or a manufactured state, the same being intended to produce what is termed Prussian blue dye, including the various shades of blue, green, lavender, purple, plum, brown, &c."

Claim.—"What I claim as my discovery, is the peculiar compound of nitrate of potash, or nitrate of soda, and muriate of soda, with the sulphuric acid and coloring matter, by which I make a superior and much cheaper dye than has before been made, to produce such colors in fabrics, when dyed in manner and for the purpose described and set forth."

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92. For an *Improvement in Type Casting Machines;* John J. Sturgis, City of New York, March 27; (anté dated September 27, 1848.)

The patentee says,—"The nature of my invention consists in combining with the nipple of a type casting machine a conical plug or piston valve, which plug valve, by means of an arrangement of levers attached to the frame of the machine, and connected with the plug stem and a cam on the driving shaft, works within a chamber box, forming the back part of the nipple on the inside of the bath."

Claim.—"What I claim as my invention, is the conical plug, and arrangement of the chamber in which it works, in combination with the nipple, and bath, and well of a type casting machine; and also, in combination with the conical plug, I claim the arrangement of the levers and cam, in the manner and for the purpose set forth."

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93. For an *Improvement in Self-Lighting Lamps;* Alexander Bennett, City of New York, March 27.

The patentee says,—"The nature of my invention consists in an improved machine for igniting matches and lighting lamps, by means of a set alarm, or to be actuated by the hand through a variety of means, as described herein."

Claim.—"What I claim as my invention, is the combination of a shaft actuated by springs, which may be relieved from confinement, and turn the shaft with the disks and match, so as to bring it in contact with the igniting table, and present the blaze of the ignited match to the lamp, and light the same in manner described, by means of an alarm of any kind."

94. For an *Improvement in Harvesting Machines;* Jonathan Haines, Union Grove, Whiteside county, Illinois, March 27.

Claim.—"What I claim as new, is suspending the frame which carries the conveyor, reel, and cutter, upon the axles of the wheels, when the frame, thus suspended, is hinged to the tongue, and rendered capable of being turned upon its bearings by means of a lever, for the purpose of elevating and depressing the cutter."

RE-ISSUES FOR MARCH, 1849.

1. For an *Improvement in Propelling Ships;* John Ericsson, City of New York; patented December 31, 1848; re-issued March 10.

Claim.—"What I claim as my invention, is the above described location or arrangement of the propeller shaft, in combination with the rudder, made with a slot or recess to admit of the play thereof, in the manner and for the purpose specified.

"I also claim sustaining the propeller abaft the rudder by a swinging or sliding frame, in combination with the shaft made in two parts, in the manner and for the purpose specified.

"And finally, I claim, in combination with the arrangement and location of the propeller shaft, and the hanging of the propeller in a sliding or moving frame, the making of the shaft in two parts."

2. For an *Improvement in the Saw Mill for Re-Sawing Boards and other Timber;* Pearson Crosby, [no residence given,] patented November 3, 1841; re-issued March 10.

The patentee says,—"The principle or character of the first part of my invention consists in the method of presenting the board to the action of the slitting saw, by pressing it against a rest by means of a pressure roller or rollers, or the equivalent thereof.

"And my invention also consists in the method of straining the saw by means of two stirrups, one secured to the end of the saw towards the back edge, and the other towards the front edge, and these two stirrups, in turn, being connected by a play-joint with a third or straining stirrup, connected with the saw frame or gate."

Claim.—"What I claim as my invention, is the method of presenting, gauging, or guiding the board, by means of the rest and pressure rollers, or their equivalents, in combination with the saw.

"And I also claim the method of hanging and straining the saw, by the combination of three stirrups at the ends of the saw, constructed and connected in manner substantially as herein described."

3. For a *Machine for Sewing Cloth of all kinds with a Running Stitch;* Benjamin W. Bean, City of New York; patented March 4, 1843; re-issued March 10.

The patentee says,—"My invention consists of a combination of gear wheels and a needle, so applied together, and arranged with respect to each other, that the gear wheels, when they are revolved and cloth is passed between them, shall make or form what I term the doubles, or the bends, corrugations, or foldings of the edges of the cloth, necessary for the passage of the needle through it, in order to the performance of the sewing of the running stitch."

Claim.—"What I claim as my invention, is the combination of a straight or curved needle and two or more gear wheels, for forming the doubles or corrugations of the cloth, the whole being made to operate essentially as specified. And, in combination therewith, I claim one or more cogged wheels, applied as specified, and for the purpose of advancing the doubles of the cloth along the needle as above explained.

"I also claim the mode of preventing either retrogradation or any improper movement of the needle, viz., by making it with a crook or bend, and placing against said bend one, two, or more wheels, as described."

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4. For *Improvements in Barrel Machinery;* William Trapp, Jr., Dryden, Tompkins county, New York; patented October 1, 1845; re-issued March 10.

Claim.—"What I claim as my invention, is, 1st, the combination of the slide rest, guided in the manner set forth, with the tool for turning off the cask, constructed and arranged in the manner set forth.

"2d, I also claim the apparatus for chamfering, and howelling and crozing: that is to say, the combination of the cylinder, open at both ends, so that both ends of the cask can be worked off without changing, with the ring chucks for fastening the cask into the cylinder, and with the tools, as herein described, for chamfering and howelling.

"3d, I also claim the crozing tool with the changeable face plate, as set forth.

"4th, I likewise claim the combination of the stock, cutter, adjustable and gauge plate, constituting the tool for turning and smoothing the outside of the cask.

"5th, I likewise claim the peculiar construction of the tool for howelling the cask, as described.

"6th, I likewise claim the peculiar construction of the tool for chamfering the ends of the cask, as described.

"7th, I likewise claim the mode of edging and jointing bilge staves, for making barrel and other bilge work, by the employment of a swing, having a concave or convex bed, in or against which the stave is sprung and secured to the required bilge, in combination with the revolving edging saw and reciprocating straight jointer, or either, whether the said swing frame for confining the stave in its bent position and conveying it to the edging saw and straight jointer, be constructed, arranged, and operated in the manner set forth, or in any other mode or manner substantially the same, and by which analogous results shall be produced."

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5. For an *Improvement in Preparing Wool and Cotton for Carding;* Geo. L. Mason, Williston, Chittenden county, Vermont; patented September 4, 1847; re-issued March 20.

The patentee says,—"The nature of my invention consists in making the fibres of wool (or other fibrous material) sufficiently soft, pliable, and yielding, for passing through the operations of carding and spinning, by thoroughly penetrating each fibre thereof with steam, just previous to, and during, the operations of carding and spinning, by which I am enabled to dispense with the use of oil for softening the fibres of wool, preparatory to performing the above named operations upon the same."

Claim.—"What I claim as my invention, is the application of heat and moisture to wool by means of steam, for the purpose of rendering its fibres sufficiently soft, flexible, and pliable to pass through the operations of carding and spinning, without requiring the use of oil upon the same.

"I also claim the application of steam to cotton or other soft fibrous substance, for the purpose of giving additional softness and flexibility to their fibres during the operations of carding or spinning."

DESIGNS FOR MARCH, 1849.

1. For a *Design for Stoves;* Henry C. Fay, Troy, New York, March 10; anté dated December 2, 1848.

Claim.—"What I claim, is the production of a new set of stove patterns, described in the accompanying drawing."

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2. For a *Design for Stoves;* Jones & Finney, Pattonsburg, Virginia, assignees of S. W. Gibbs, Albany, New York, March 20.

Claim.—"What I claim as my invention, is the combination and arrangement of ornamental figures and forms, represented in the drawings, making an ornamental design for a cooking stove."

List of American Patents which issued in the month of April, 1849, *with Exemplifications by* CHARLES M. KELLER, *late Chief Examiner of Patents, in the U. S. Patent Office.*

1. For an *Improvement in Spectacle Frames;* Jacob Shaw, Jr., Hinckley, Medina county, Ohio, April 3.

Claim.—"What I claim as new, is combining either one pair, or any desired number of pairs, of glasses or lenses in one frame, so that if a glass or lens be moved, its mate or the other member of the pair will, by means of the interlocking of the teeth of the small wheels, sectors, or gearing, or its equivalent, have an equal or simultaneous motion, and each member of each pair will, at all times, be in a position corresponding with its mate;

and this I claim, irrespective of the manner of uniting the bands which surround the lenses with the connecting arms, or the means of combining the clutch bar with the clutch arms.

"I also claim that part of the apparatus which I have named the clutch arm, composed of a slider-socket and slider, constructed and combined with each other in manner and for the purposes as set forth and described, whether such clutch arms are used in combination with the other parts of the spectacles herein described, or with parts of spectacles of any other description; and this I claim, irrespective of the eye formed on the end of the clutch arm, or the manner or means by which they may be combined with spectacles."

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2. For an *Improvement in Locomotive Baby Tenders;* J. Cutts Smith, Boston, Massachusetts, April 3.

Claim.—"I claim as my invention, all the three upright posts or movable arms, moving in or out, and operated by an increased power spring, for the purpose intended and described."

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3. For *Improvements in Re-Action Water Wheels;* Jesper Smith, Mansfield, Warren county, New Jersey, April 3.

The patentee says,—"The nature of my invention consists in placing valves on the end of the arms of a centrifugal water wheel, whereby the discharge of the water may be changed and the motion of the wheel consequently changed likewise."

Claim.—"What I claim as my invention, is causing water to flow at pleasure in different directions from the centrifugal water wheel or engine, thereby reversing the direction of its revolutions."

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4. For an *Improvement in Planing Machines;* Chas. A. Spring and Wm. H. Derrick, Kensington, Philadelphia county, Pennsylvania, April 3.

The patentees say,—"The nature of our invention consists in the construction and arrangement of the cutter knives or bits, for planing boards and reducing them to a thickness, and also tongueing and grooving the same, all at one operation."

Claim.—"What we claim as new, is, 1st, the combination of the disked cutter wheel and stationary bit in the frame, in the manner and for the purpose set forth."

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5. For *Improvements in Deep Sea Diving Bells;* J. A. Richards and J. A. Wolcott, Boston, Massachusetts, April 3.

Claim.—"What we claim as our invention, is the combination of working rods with the diving bell, by means of ball and socket, or their equivalents, as set forth."

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6. For *Improvements in Rotary Engines;* John C. Howard, Williamsburg, Kings county, New York, April 3.

Claim.—"What I claim as new, is the recess within the circle of the steam channel, in which is placed an expansion plate, on which the heat can act in the manner and for the purpose set forth, and having the friction of the revolving wheel confined to that part of the stationary case which can be made to expand and contract with said wheel."

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7. For *Improvements in Bank Locks;* Henry C. Jones, assignee of Henry Ritchie, Newark, New Jersey, April 3.

Claim.—"What I claim as new, is the manner of combining the slide with the combined cams or escapement, and with the dog and the pin, for the purposes set forth. I also claim the manner of combining the additional tumbler with the revolving 'scutcheon, under an arrangement and for the purpose herein fully made known."

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8. For an *Improvement in Machinery for Turning Lasts, &c.;* Elbridge Webber and Charles Hartshorne, Gardiner, Kennebec county, Maine, April 3.

The patentees say,—"The nature of our invention consists in turning regular, irregular, and plain figures from reverse patterns and forms."

Claim.—"What we claim as our invention, is, 1st, the method of finishing the heel and toe of the last, by holding the pattern and last in cylindrical holders and removing the centres, and applying the centres simultaneously to the toe and heel.

"2d, We likewise claim the mode of varying the form or fashion of the last whilst turning, by means of the adjustive pawls and pawl wheel, combined with the machinery for operating the reverse patterns, as set forth."

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9. For *Improvements in Machinery for Making Iron Wheel Tires;* Thomas W. Allen and Charles W. Noyes, Greenbush, Rensselaer county, New York, April 3.

Claim.—"What we claim as our invention, is the combination of the drawing-out and forming rollers mounted on the vertical shafts, so geared and arranged that one can be moved towards and from the other, when this is combined with the bed plate for guiding and keeping the edge of the tire true.

"We also claim, in combination with the drawing-out and forming rollers, the employment of the auxiliary roller, for determining the circle of the tire to be formed, when the said auxiliary roller is so connected with the slide of the movable forming rollers, that the auxiliary roller may be adapted to the increasing diameter of the tire as it is being drawn out."

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10. For the *Employment of an Auxiliary Engine in Combination with the Condenser Pump;* John Ericsson, City of New York, April 3.

The patentee says,—"The object of my invention is to condense the steam without admixture with the condensing water, and to condense the steam that escapes from the safety valve, and also for the production of fresh water for any other use."

Claim.—"What I claim as my invention, is the combination of the condenser of a steam engine for the propelling of a ship or other vessel, with a pump that receives the condensing water from outside of the vessel, and causes it to pass the condenser, when the said pump is operated by an auxiliary engine.

"And I also claim the double connexion of the condenser: that is, with the exhaust of the propelling engine, and with the boiler, when the said condenser is combined with a pump that receives the condensing water from outside of the vessel, and is impelled by an auxiliary engine."

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11. For an *Improved Auger Stock;* William T. Barnes, Buffalo, Erie county, New York, April 3.

Claim.—"What I claim as my invention, is, 1st, the combination of the revolving adjustable handles with the stock.

"2d, The combination of the turning collar, on the shank of the auger, with the stock, the collar to be grasped in the hand to guide the auger, when beginning to bore a hole, while being turned by the handle, adjusted so as to operate in the manner of a winch, whereby the auger is more steadily held, and more readily entered into the wood."

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12. For *Improvements in Raising and Conveying Water;* John J. and Saml. P. Cox, Shippensburg, Cumberland county, Pennsylvania, April 3.

The patentees say,—"The nature and principle of this invention is to send a bucket from a house on an inclined rail made of wire or stout rope, and to have the bucket drop into the well to be filled with water, then drawn up again and carried back to the house up the inclined rail; the whole movement being directed by the unwinding and winding of the cord to which the bucket is attached, over a drum or pulley operated by a handle."

Claim.—"We claim the combination of the spring cams with the cap pieces of the carrier, the slide and the bucket top, for holding and releasing the carrier.

"We also claim the spring fork, in combination with the bucket ring and the upright rod or arm, to hold and release the bucket, and to catch again into the ring of the bucket at proper times."

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13. For an *Improvement in Saws;* Ebenezer Clark, Rushville, Schuyler county, Illinois, April 3.

Claim.—"What I claim as my invention, is the movable and loose teeth, in any kind of saw, regardless of shape or form, or manner of insertion, for I am aware that they can be made in other shapes, and placed in blades made different, that would answer as well."

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14. For *Improvements in Machinery for Picking Wool, &c.;* Reuben Daniels and Albert G. Dewey, Woodstock, Windsor county, Vermont, April 3.

Claim.—"What we claim as our invention, is the forming of the concave of a series of rolling bars, geared together at the ends, in the manner and for the purpose specified, in combination with the picker cylinder; and finally, we claim, in combination with the picker cylinder, the slow-turning rollers placed above the delivery, substantially in the manner and for the purpose specified."

15. For an *Improvement in Boot Crimps;* Sardius Pasco and Elihu Perry, Cato, Cayuga county, New York, April 3.

The patentees say,—"The nature of our invention consists in the arrangement and combination of the movable parts of the crimp, and the clamp or vise gripe for holding the leather."

Claim.—"What we claim as new, is the combination and arrangement of the movable parts of the clamp with the stationary part, in the manner set forth."

16. For an *Improved Awl Haft;* Wm. A. Dodge, West Cambridge, Massachusetts, assignee of Dexter H. Chamberlain, Boston, Massachusetts, April 3.

Claim.—"What I claim as my invention, is a tool handle or awl haft, having a split shaft for the holding of the tool, which is forced outwards by a screw shaft, attached to the underside of the cap, and abuting against the top of said split shaft, as set forth, said screw shaft being worked as specified."

17. For a *Machine for Paying Seams of Vessels;* Samuel Baker, Portsmouth, New Hampshire, April 3.

Claim.—"What I claim as my invention, is the revolving paying wheel, in combination with the supply box, or with the supply box and feeding wheel, the whole constructed and operating substantially in the manner and for the purposes herein described."

18. For an *Improvement in Lubricating Compounds;* John Cumberland, Mobile, Alabama, and Wm. P. Cumberland, New Albany, Floyd county, Indiana, April 3.

The patentees say,—"The nature of our invention consists in forming a base for the lubricating mixture, by combining potash or other alkaline substance with fresh water and oil, lard, or resin, (or other oily, fatty or resinous substance,) in such, or nearly such proportions as will neutralize the alkaline properties, and then combining or mixing with the said base more fresh water, and pulverized steatite or other analogous substance.

Claim.—"What we claim as new, is, 1st, the combining of potash, or other alkaline substance, with water and oil, lard, or resin, (or other oily, fatty, or resinous substance,) by the process as herein described, into a neutral or nearly neutral compound, as a base for a lubricating mixture, substantially as described."

19. For an *Improvement in Cooking Ranges;* Frederick S. Merritt, City of New York, April 3.

Claim.—"What I claim as my improvement, is, 1st, the syphon shape of the air chamber, for the purpose of moderating the heat acting on the side of the oven nearest the fire chamber.

"2d, I claim the special arrangement and combination made by me of the ovens, fire chamber, draft, ash pit, and syphon chamber, as set forth."

20. For a *Machine for Spherifying Bullets or Pills;* Jonathan F. Ostrander, City of New York, April 3.

Claim.—"What I claim as my invention, is the oblique gyration of one hemisphere within another, for the purpose of spherifying any mass of matter in the manner described. I also claim the slot, or any outlet for the purpose of letting out the bullets."

21. For an *Adjustable Dam or Water Weir;* Milow S. Wheaton, Riga, Monroe county, New York, April 3.

Claim.—"What I claim as my invention, is the combination of the two inclined leaves or float gates, with each other and the paddle gates, the whole arranged as described, between abutments, and forming an adjustable dam and waste weir."

22. For an *Improved Gold Washer;* William H. Jennison, City of New York, April 3.

Claim.—"What I claim as my invention, is the method of separating gold from earthy matter, by means of a rotating inverted conical pan provided with an internal spiral flanch."

23. For a *Concentric Centrifugal Gold Washer;* James A. Bull, City of New York, April 3.

Claim.—"What I claim as my invention, is the machine consisting of two hollow vessels of convenient thickness and size, placed one within the other, so as to leave a space between them, and revolving, so as to prepare the gold and mass of other matter with which it is mixed, and also to separate the gold from such other matter, as described."

24. For an *Improvement in Cast Iron Car Wheels;* Carmi Hart and Nathan Washburn, Rochester, New York, April 3.

Claim.—"What we claim as new, is the combination described, of arms and flanches or plate, said flanches or plate and arms being curved in the manner and for the purposes set forth."

25. For a *Double Hinged Water Guard;* John Burt, Tiverton, Newport county, Rhode Island, April 3.

The patentee says,—"The nature and operation of my invention consist of an under guard, so connected and protected by an upper guard as to be kept tight on the threshold of the door, and effectually prevent any wind, water, snow, dust, or small particles of matter, getting under it into the building."

Claim.—"What I claim as my invention, is the double combined guard, with the lower guard hinged to the upper one, and protected by the lip or outside fender thereto attached."

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26. For an *Improvement in Hulling Machines;* Dan Pease, Jr., Floyd, Oneida county, New York, April 3.

Claim.—"What I claim as my invention, is, 1st, the combination of the screw section of the cylinder with the ribbed or toothed section, arranged and operating in the manner and for the purpose set forth."

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27. For an *Improved Bank Lock;* David M. Smith, Springfield, Windsor county, Vermont, April 3.

Claim.—"What I claim as my invention, is a combination of the following elements, as applied to the main bolt of a lock, and operated by a key made with either fixed or changeable bitts, the whole arranged and constructed as explained.

"The first of said elements of combination is a notch, a shoulder, or any mechanical equivalent therefor, made in the main bolt, or otherwise properly applied to it.

"The second of the said elements is the spring dog.

"The third of the said elements is the catch plate or lever plate, turning on a pin projecting from the main bolt, and having a spring affixed to it and the bolt, for the purpose of throwing the plate down into the notches of the slide plates.

"The fourth of the said elements is a series of notched slide plates, arranged within a cylinder or rotating shaft provided with retractive springs, and constructed and made to operate in line of the axis of the cylinder or shaft.

"The fifth and last of said elements is the rotary shaft or cylinder, made as described, and provided with a bitt or stud for operating in a notch made in the main bolt, and for the purpose specified."

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28. For an *Improvement in Brakes for Railroad Cars;* Leverett Treadwell, City of New York, April 3.

The patentee says,—"My invention consists of a truck with runners, of the ordinary shape, constructed in the usual manner, attached to, and placed underneath, the bodies of locomotive and railroad cars."

Claim.—"What I claim as new, is the application of a truck to locomotive and railroad cars, so as to act upon the track rails, in combination with its several parts, constructed as specified, operating in the manner as described and for the purpose set forth."

29. For an *Improved Method of Measuring the Action of the Valves in Direct Action Pumping Engines;* Henry R. Worthington and William H. Baker, City of New York, April 3.

Claim.—"What we claim as new, is the removing or reducing the resistance against the pump piston, in direct action steam pumps, at the proper time in the stroke, by effecting a connexion between the water on both sides of the piston, in order to allow either the momentum of the moving parts, or the expansion of the steam already within the cylinder, or both conjoined, to act as explained, to throw the steam valve across the ports with certainty, whether at high or low speeds.

"2d, We claim the method described of effecting the before mentioned and claimed object, namely, by making two passages into each end of the cylinder, across one of which the piston is forced, opening, by this means, free communication between the two ends of the cylinder."

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30. For an *Improvement in Bedstead Fastenings;* John D. Sanborn, Bennington, Wyoming county, New York, April 3.

The patentee says,—"The nature of this invention consists in securing the rails of the bedstead to the posts, by means of castings secured in the ends of the rails, and entering suitable openings communicating with each other in the posts."

Claim.—"What I claim as my invention and improvement on Gaunt's patented bedstead fastening, is making an oval opening through the tenon of the end rails, through which the tenon on the side rail is passed, and forming a spiral bevel around said opening, against which the beveled projection on the tenon of the side rail acts in the manner of a screw, as it is turned, causing the two tenons thus interlocked to act in perfect unison, and to draw the shoulders of the end and side rails simultaneously against the sides of the posts, and to make perfect joints without the liability of breaking the spiral bevels, said bevels being of great strength, arising from their continuous and unbroken form, the parts sustaining each other around the oval opening, by which a simultaneous movement of the posts towards the shoulders of the rails is effected by simply turning the two side rails."

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31. For an *Improvement in Carriage Springs;* Hiram T. Hyde, Troy, Rensselaer county, New York, April 3.

Claim.—"What I claim as my invention, is, 1st, making the plates of elliptic and other carriage springs of a transversely or diagonally crimped, fluted, or ribbed form, as described, by which they are rendered universally flexible, and can be made of a given strength, with less material and expense than the common elliptic spring.

"2d, The combination of the crimped spring with a semi-elliptic many-leaved spring, in the manner and for the purpose set forth."

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32. For an *Improved Punching Machine;* Stephen Kendall, Kalamazoo, Kalamazoo county, Michigan, April 3.

Claim.—"What I claim as my invention, is the combination of the knuckle and its attached lever, with the toggle and connecting rods, arranged and acting as described, so that by a motion in one direction, of the lever, the punch can be both raised and depressed."

33. For an *Improvement in Metallic Pens;* Matthew S. Fife, Philadelphia, Pennsylvania, April 3.

The patentee says,—"The nature of my invention consists in dividing the pen, through nearly its entire length, with a slit, or a slit connected with a slot or hole, for the purpose of facilitating the operation, in its manufacture, of closing the slit and adjusting the nibs. It also consists in so placing the slit that an obliquity, or inclination of the point towards the right, is given to the pen without increasing its size, materially injuring its symmetry, or otherwise rendering it less convenient to use than the common straight pen."

Claim.—"What I claim as my invention, is, 1st, the providing the pen with a slit or opening, extending nearly through its entire length, in the manner and for the purpose described. 2d, And, in combination with such slit, I claim forming an oblique pen in the manner described."

34. For a *Combination of Ash Trap with Puddling and Re-Heating Furnaces;* Lewis Scofield, South Trenton, Mercer county, New Jersey, and Edward Cooper, City of New York, April 3.

Claim.—"What we claim as our invention, is making a depression in the roof of re-heating or puddling furnaces, arresting the solid particles of coal, ashes, and other matter, upon a space or chamber provided for the purpose, in combination with the heating or puddling bottom or bottoms of re-heating or puddling furnaces, whereby the iron under treatment is protected from the injurious effects of the solid matters carried up from the grate by the draft or blast, as described."

35. For an *Improved Method of Mounting Porcelain Roses for Doors;* Jas. Bell, City of New York, April 3.

Claim.—"I claim as my improvement, the metallic socket, constructed as described, in combination with a mineral, porcelain, or glass rose, the whole being arranged, adapted together, and used in the manner described."

36. For an *Improvement in Dress Pins;* William and John Richardson, assignees of Walter Hunt, City of New York, April 10.

Claim.—"My claims in the above described invention are confined to the construction of dress pins, hair pins, &c., made from one entire piece of wire or metal, (without a joint or hinge, or any additional metal, except for ornament,) forming said pin, and combining with it, in one and the same piece of wire, a coiled or curved spring, and a clasp or catch, constructed as set forth."

37. For an *Improvement in Elevating the Tops of Piano Fortes;* Conrad Meyer, Philadelphia, Pennsylvania, April 10.

Claim.—"What I claim as my invention, is the connecting the main portion of the top of a piano to the body or case of the instrument, in such a manner that either its front or rear edge can be elevated at pleasure, to allow a free escape of sound, and enable the performer, at the same time, to see and be seen, to wit: by means of the metallic hinge bars, combined with the said main portion of the top of the piano, and inserted into guiding metallic supports, and steadying grooves or apertures, at each extremity of the instrument, in the manner set forth."

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38. For an *Instrument for Drawing Spikes;* Patrick Bryant, Chesterfield, Hampshire county, Massachusetts, April 10.

The patentee says,—"The nature of this invention consists in curving the end of a metallic bar or rod, provided with a suitable handle at its opposite extremity, downward and outward, and tapering the same so as to bring it to an edge, and attaching to near the edge of the same, by means of a pin or bolt upon which it moves, a curved metallic casting, bent and brought to an edge at one extremity, so as to resemble a bill-hook in its side elevation, and bent at the other end, at right angles, or nearly so, with its lower surface, in such a manner that, when the instrument is brought in proper relation to the nail to be drawn, by bringing the edge of the end of the bar, and the bill-hook edge of the casting, on either side of the same, and resting the straight end of the casting on the surface into which the spike or nail is driven, and depressing the handle of the bar, the spike or nail will be embraced between said edges, and drawn with the greatest facility."

Claim.—"What I claim as my invention, is forming the lower end of the metallic bar (provided with a handle at its opposite end) somewhat after the form of a cima-reversa, and brought to an edge, and attaching to the same, by means of a pin or bolt, a curved slotted casting, made of a bill-hook form at one end, and also brought to an edge at that end, and bent at right angles at the other, in such a manner that, by placing the right angled end of said casting on a solid basis, and grasping the spike or nail between the edges of the casting and bar, and depressing the handle, the spike or nail will be drawn from the material into which it is driven with the greatest facility."

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39. For an *Improvement in Threshing Machines;* Thos. N. Shipton, Lewistown, Mifflin county, Pennsylvania, April 10.

Claim.—"What I claim as my invention, is the peculiar form of the teeth, by which clover seed can be hulled and grain threshed in the same machine, each of said teeth being a combination of a jagged semi-ellipse, a trapezoid, and a shank, as described."

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40. For an *Improvement in Bee Hives;* Stephen Titcomb, Farmington, Franklin county, Maine, April 10.

Claim.—"What I claim, is the manner of combining the upper and lower rods, or entrance passage, with the main or central hives, as set forth, said rods and passages being long and narrow, for the purpose mentioned, and so constructed that, while the external communication is cut off, the ventilation may still go on by the means described."

41. For an *Improvement in Tailors' Measures;* John Carpenter, Uniontown, Fayette county, Pennsylvania, April 10.

Claim.—"What I claim as my invention, is the combination, with the square, of the exterior radial arm and the interior radial arm, having thereon the several scales, divided and numbered as represented, for the purpose of protracting garments from measures taken upon the person, in the manner substantially as set forth."

42. For an *Improvement in Machines for Dressing Stone;* Charles Wilson, Springfield, Hampden county, Massachusetts, April 10.

Claim.—"What I claim as my invention and improvement, is the construction of the staging for carrying the stone, consisting of a movable platform, capable of raising and lowering, in combination with the frame for producing the reciprocating motions, so that these several motions may be had singly or in movements variously combined, in the manner and for the purposes described."

43. For an *Improvement in the Spring Lancet;* James H. Johnson, St. Louis, Missouri, April 10.

The patentee says,—"The nature of my invention consists in the combination of a spring catch and a counter spring with the shank of the blade of a spring lancet, in such a manner that, at the instant the blade penetrates the vein, its shank will detach the counter spring from its spring catch, causing it (the counter spring) to throw back the lancet blade, and thereby preventing all danger from sudden muscular action at the moment that the vein is penetrated.

Claim.—"What I claim as my invention, is the combination of a counter spring and spring catch with the shank of a spring lancet, in the manner and for the purpose set forth."

44. For an *Improvement in Hulling Machines;* Daniel Pease, Jr., Floyd, Oneida county, New York, April 10.

Claim.—"What I claim as my invention, is, 1st, the combination of the radial wedge-formed rubbers and the segment wings on the lower end of the cylinder, arranged and operating in the manner and for the purpose set forth.

"2d, I claim constructing the horizontal bed plate of the stationary cylinder with curved segment ribs around the centre of the bed plate, in combination with the radial ribs, arranged and operating in the manner and for the purpose set forth."

45. For an *Improvement in Skiving Leather;* Benjamin S Mathews, Stamford, Fairfield county, Connecticut, April 10.

Claim.—"What I claim, is the combination of the blade, roller, and inclined or horizontal carriage, for pressing down and skiving to a bevel, or to a level or even thickness, the leather, as described.

"2d, I also claim the combination of the eccentric and springs with the clamp, as an apparatus for confining and disengaging the leather, in the manner described."

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46. For an *Improved Nail Plate Feeder;* Hannah and Charles M. Diehl, administrators of William Diehl, Norristown, Montgomery county, Pennsylvania, April 10.

The patentees say,—"The purpose of this invention is to feed the strips of nail plate, from which cut nails are to be formed, to the machine which is to cut and form the nails."

Claim.—"What we claim, is the combination and application of the rack wheel, its axle and the springs upon it and the outside wheel, the ratchet and the two levers for pushing and holding it, and again letting it be drawn back by the weight, in the manner and for the purpose set forth."

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47. For an *Improvement in Cooking Stoves;* Fitch R. Babcock, Westfield, Hampden county, Massachusetts, April 10.

The patentee says,—"The nature of my invention consists in providing a common oven, of cylindrical or other convenient form, with a furnace placed within it. The oven is provided with a perforated plate, upon which are fixed circular revolving tables, and also a short cylinder through which the furnace passes, and also through the centre of the main body of the oven. At the bottom of the furnace is a movable grate operated by a lever; at the top of the furnace is placed a second furnace, for boiling, heating flat-irons, and for other purposes."

Claim.—"What I claim as my invention, is the combination of the perforated plate with the revolving tables and cylinder, for the purposes set forth. I also claim as my invention, the manner of using the movable grate, adjusted by a lever in the bottom of the cylindrical furnace."

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48. For an *Improvement in Shaving Brushes;* William S. Jewett, City of New York, April 10.

Claim.—"What I claim as my invention, is the introduction of the soap by means of the screw and tube, through the handle into the brush, by which it may be fully impregnated; and also the combination, in one, of the box and brush, thereby saving time and trouble, for it is only necessary to wet the brush, and while the lather is making on the face the beard is softened."

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49. For an *Improvement in Planing Machines;* John Levy, City of New York, assignee of Hazard Knowles, Washington, D. C., April 10.

Claim.—"What I claim as new, is the method of holding the board firmly against the bearing bench or roller of a planing machine, by means of the obliquely placed rotary guides firmly pressed against the edge of the board, and drawing it to the bed in the manner set forth.

"I also claim the oblique rotary guides described, in combination with a cutter wheel, having bevels or offsets around its face, and also with the adjustable plates in front of the smoothing cutters set in its plain face, as set forth."

50. For an *Improvement in Machinery for Dressing Shingles;* Lewis Stockwell, Sutton, Worcester county, Massachusetts, April 10.

Claim.—"What I claim, is my improved organization or combination of mechanism, for holding, shaving, and discharging the shingle, the same consisting of the following elements, as constructed and made to operate as specified: that is to say, 1st, the knife frames and cutting knives; 2d, the system of pressure rollers and their supporting springs; 3d, the spring holder I; 4th, the bearer; 5th, the spring holder K; 6th, the spring discharging and receiving bars; meaning to claim the spring holders, the bearers, and the spring receiving and discharging bars, in combination with one another, and the cutting planes, and as constructed and made to operate therewith substantially as described."

To be Continued.

MECHANICS, PHYSICS, AND CHEMISTRY.

Lectures on Static or Franklinic Electricity, delivered before the Royal Institution. *By* PROF. FARADAY.*

(Continued from page 324.)

The *Fifth Lecture* by Mr. Faraday, on Static Electricity, was delivered to a crowded audience. The effects of induction in producing the remarkable phenomena of the Leyden jar, and of the electrophorus, constituted the principal subject of the lecture, but it was introduced by some further explanations of the cause of the rapid emission of electricity from points.

When a cylinder is made smaller at one end than the other, and a charge of electricity is induced in it, the electricity at the larger end has more space to expand in than it has at the other, and it consequently becomes more condensed, and exerts greater power to communicate with surrounding bodies. This effect is increased by diminishing one end of the cylinder to a point; and a metal point was attached to the prime conductor of the machine, for the purpose of showing in how short a time all the electricity is dissipated under such circumstances.

In resuming the consideration of the phenomena of induction, Mr. Faraday explained the effects of the condenser. The condenser is an apparatus consisting of two disks of metal mounted perpendicularly, in such manner that one disk, connected with the earth, may be brought close to the surface of the other, which is insulated. When so placed, a feeble charge of electricity, which is inappreciable by the electrometer, becomes condensed, and is very manifest when the disk connected with the earth is removed;

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* From the London Mining Journal, Nos. 720, 721, 722.

the thin stratum of air between the two disks having caused the induction of electricity in the opposing disk. When a plate of glass instead of air is interposed, the effects become much stronger, and such an arrangement forms the elements of the Leyden jar.

The apparatus thus fitted, with a plate of glass between the disks, was charged by the electrical machine, and exhibited, in the density of the sparks emitted on the discharge, and the loudness of the report, the same phenomena as the discharge of a small Leyden jar. In this case the electricity from the machine, communicating with the insulated disk, induced the opposite state of electricity in the disk on the other side, which had a communication with the earth, and the glass, by its non-conducting property, having the power to keep the two electricities apart, a large quantity of electricity was accumulated on the glass; thus, when a communication was made between the two disks, all the effects of the electric shock were produced.

The discovery of the Leyden jar, which gave great stimulus to electrical investigations in the middle of last century, was occasioned by the attempt to confine electricity in a bottle. A small glass bottle having been filled with water, was held by M. Cunæus, of Leyden, while it was being charged; and having put his other hand to the nail which served for the connecting wire, he was greatly terrified at receiving a shock. The experiment was repeated by others, and the philosophers of that day, being much alarmed by the power they had evoked, gave most exaggerated accounts of the effects of the shock. M. Muschenbrock, after experimenting with a small drinking glass, stated that he had been struck on his arms, shoulder, and breast, so that he lost his breath, and was two days before he recovered from the blow, which he would not have repeated for the whole kingdom of France!

The convulsive action of the electric shock on the muscles is, indeed, Mr. Faraday observed, one of the most remarkable phenomena of electricity, and, viewed in relation with the electrical condition of many animals, tends to prove the connexion between electricity and nervous influence.

Small bottles of water, exemplifying the kind of Leyden jars at first employed, were exhibited, and in charging one of them Mr. Faraday received a shock, which, though not great, made him start, for he has not been able, he said, to bring his muscles to stand the effect of an electric shock, nor to receive one without annoyance.

Experiments were exhibited to prove that the charge of a Leyden jar resides in the glass, and not in the tinfoil with which the glass is coated. The metallic coatings of a charged jar were changed without much loss of the charge, and a charged jar, when deprived of its interior connecting wire, manifested no trace of electricity when tested by the electrometer.

The electrophorus affords nearly as curious an illustration of the effects of induction as the phenomena of the Leyden jar. When a flat surface of resin is excited by being rubbed with dry flannel, it induces a large quantity of electricity in an insulated metal disk, from which sparks may be taken an unlimited number of times by repeating the operation of pressing the disk on the resin, touching it with the finger, and then lifting it off by the glass handle. These effects are caused by the electricity induced through the air between the interstices of the surface of the resin; for if the resin and the metal were perfectly flat and smooth, so as to come into contact throughout, the whole of the electricity would be carried off on the first application of the disk.

Sixth Lecture.—The consideration of the various effects of different modes of electric discharge formed the subject of Mr. Faraday's sixth lecture. The discharge of electricity may take place in a variety of ways and imperceptibly, but its effects are most manifest in what is termed the disruptive discharge, when the accumulative force of the electricity breaks through resisting bodies.

It has been remarked as a singularity in the electric discharge, that the force seems to act from the centre externally in opposite directions, and in passing through a card, for instance, perforates a hole with a burr on each side; this the advocates of the vitreous and resinous theory of electricity have considered confirmatory of their opinions; but in point of fact, as Mr. Faraday said, all forces moving rapidly in one direction produce the same effect; and specimens were shown of metal penetrated by balls, which presented the appearance of a burr on each side.

The disruptive discharge occasions a displacement of the particles of the bodies through which the electricity forces a passage, and it is this sudden displacement, or expansion, which occasions the rending effects of lightning, and not the action of the lightning alone, of the nature of which nothing is known.

The experiment of the electrical mortar, by which a small cork ball is thrown out by passing the charge of a Leyden jar through the enclosed air, was shown, to illustrate the mechanical effect of the spark on air; and a glass tube, filled with water, was broken and shattered, to show the effect of a shock on fluids. The glass tube was estimated to bear a pressure of five atmospheres, yet the glass was shivered near the fracture in a manner to indicate the great activity of the force by which it had been broken. The rending power of lightning, when passing through the fluid and air vessels of a tree, may, therefore, be conceived to be immense, and among other specimens on the lecture table was a large quantity of small splinters, into which an oak tree had been riven by lightning.

To illustrate the heating power of electricity, numerous experiments were made. The firing of gas by a spark from the machine, of powdered resin by the discharge of a Leyden jar, and of a mixture of a chloride with antimony by the same means, were exhibited. Though heat is thus manifestly evolved by electricity, no sensation of heat is experienced when an electric spark or shock is received through the hand, and, as Mr. Faraday demonstrated, ether may be fired by a spark emitted from the finger, and even by ice. Ice, indeed, may in cold weather, when free from moisture, be excited like glass, and will emit sparks that will fire ether.

Some curious exemplifications were given of the different results attending the discharge of electricity under various circumstances. Gunpowder, for example, when unconfined, cannot be exploded by an ordinary electric discharge, the effect being merely to disperse the particles of the powder; but when the discharge is made through a wetted string the gunpowder is exploded. A strip of gold leaf was made part of the same circuit with gunpowder, for the purpose of showing the different effects on each when the discharge took place rapidly through wires, and when retarded by interposing an imperfect conductor, like water. When the discharge was made through wires, the gold leaf was deflagrated and the gunpowder dispersed, but not exploded; when a wet string was made part of the circuit, the gunpowder was exploded and the gold leaf was uninjured.

Static electricity was used for blasting in mining operations before the mode now adopted for the use of the voltaic battery; for which purpose the wire was ordinarily coated with an insulating substance, to prevent the discharge from taking place through the earth instead of through the wire, but the experiment had succeeded through a length of 150 feet of unprotected wire lying on the grass, proving, on a large scale, that electricity will traverse a long line of a good conductor in preference to taking a shorter course through an imperfect one. Several illustrations of the preference of electricity to the shortest course were given, by discharging a small battery through strips of gold leaf variously disposed on cards, when it was evident, by the deflagration of the gold, that the electricity had taken the shortest path.

There are so many circumstances which vary the discharge of electricity, and thereby alter its effects, that it is extremely difficult to determine the cause of the destructive action of lightning. A comparatively feeble discharge of electricity might, in some circumstances, do more damage than a more powerful one. In one case which Mr. Faraday said he had observed, a house had been set on fire by the melted globules of a copper bell-wire having fallen on some curtains; now if, in such a case, the discharge had not been interrupted, or had been more powerful, the metal might have been deflagrated and dispersed, and the house would not have been set on fire.

The different effects of larger and smaller discharges through a wire of the same size were shown; in one case the metal had been just melted, and the globules of it remained on the paper; in the other case the metal had been deflagrated, leaving a broad mark on the paper, but no remains of the metal. The state of the weather may greatly modify the effects of a discharge. When the bricks of a building, for example, are wet, they serve as imperfect conductors of lightning, and may change its rending force into a heating power; and Mr. Faraday, after two or three trials, succeeded in firing, by the discharge of a Leyden jar, gunpowder placed upon a wet brick.

Seventh Lecture.—The light of the electric spark was the subject to which Mr. Faraday almost exclusively directed the attention of his audience, and the room was for nearly the whole time darkened, to show with greater effect the brilliancy of the light and its intense power. In the first place, the power which it possesses of illuminating opaque bodies was shown, by sending sparks and the discharge of a Leyden jar through ivory and eggs, which became as distinctly illuminated as if composed of ground glass, and had been lighted within by a candle.

The instantaneous character of the light was exhibited by Prof. Wheatstone's arrangement for ascertaining the duration of the light of an electric spark. A concave mirror was made to revolve with great rapidity, and the flame of a candle was first reflected on a screen, to show that with a continuous light the impression on the retina remains until the circle is completed, and thus a circle of light is represented; but when the electric spark is reflected on the screen, the spark only was visible, without any tendency to spread, however rapidly the mirror was revolved. The flame of the candle and the spark were then together reflected on the screen, when the curious effect was seen of a luminous ring of light produced by the flame, in which luminous circle the electric spark appeared brilliantly distinct, as if the mirror had been stationary.

The duration of the electric spark had been asceitained in this manner not to exceed the five hundred thousandth part of a second. So powerful, indeed, is the light of the electric spark, said Mr. Faraday, that if it were continued even for a second it would destroy the organs of vision. The light of the electric spark is vastly more intense than what is termed the electric light, the latter being an exhibition of the luminous power in a much lower degree of intensity.

Several experiments were shown by passing the electric spark through glass vessels, in which a partial vacuum had been produced. The beautiful flood of purple light that was thus transmitted through a long tube, closely resembled the appearance of the Aurora, and Mr. Faraday observed that the identity of the Aurora with the electric light had now become firmly established, and most of the glorious phenomena of atmospheric electricity can be imitated on a small scale; showing the transition of the Aurora to a falling star, and a flash of lightning in proportion to the density of the air through which the electricity passes. In a perfect vacuum the electricity is conducted with nearly the same facility as through wires, but its track is marked by beautiful irradiations of purple light.

The electric spark is the only light known which has sufficient intensity to restore the luminosity of phosphate of lime. Some of that substance was sprinkled on a hot iron, and it emitted a strong phosphorescent light, which after a short time became extinguished; and Mr. Faraday said nothing could restore this property but exposure to the light of the electric spark, the ordinary electric light being too feeble to have any restorative effect.

Mr. Faraday exhibited the power of static electricity to communicate magnetism. By sending the discharge of a Leyden jar through several needles they became magnets, and by reversing the direction of the discharge the poles of the magnets became changed; those ends of the needles which had been north poles becoming south, and the contrary.

Eighth Lecture.—Atmospherical electricity was the branch of the subject reserved for the eighth and concluding lecture of Prof. Faraday's course, which was rendered more than usually interesting by the practical application of the science in the consideration of the grandest phenomena of nature.

At the commencement of the last century, when little was known of electricity, it had been conjectured that lightning and electricity were identical, but it was not until 1752 that the fact was established by Dr. Franklin, who, by means a kite, was enabled to draw electricity from the clouds. To illustrate the condition of a thunder cloud, a large bundle of long strips of paper, fastened together at one end, was suspended at the top of the lecture room, and it was electrified by means of a wire connected with the prime conductor of the machine. The strips of paper, apparently repelled from each other, stood out in all directions, and after the action of the electrical machine had been continued for some time, the strips continued in a state of repulsion, even when the prime conductor had been completely discharged, the air in the upper part of the room having become charged by electricity emitted from the ends of the paper, which acted in this respect like so many points.

The electrical state of the air was proved in a very curious manner. A piece of cotton wool, steeped in spirits of wine, was attached to the end of a very long fishing rod, and set on fire. From the flame a wire ran down the rod, and was placed in connexion with the electrometer, and when the flame was elevated to the upper part of the room it attracted the electricity with which the air was charged, and caused the gold leaves of the electrometer to diverge. The electricity in one part having been thus withdrawn, the flame was moved to another part with a similar result. As the strips of paper which were employed to represent a thunder cloud repelled each other with great activity, it might be supposed that a cloud, when electrified, would be dispersed by the repulsive power, but Prof. Faraday observed, that the repulsion of the papers was only apparent, the real cause of their separation being the attraction of the walls and of the ceiling around them, and that if they were in the air, with no solid bodies around, they would all be attracted solely towards the earth,—the superior attractive power would overcome all other attractions, and they would be kept together. It is in this manner that the particles comprising a thunder cloud are prevented from being dispersed by the repulsive power which bodies similarly electrified seemed to exert.

In alluding to the appearances of a flash of lightning, the Professor remarked that its course is never in a straight line, but branches out in the same way that a long spark from the electrical machine does; and though many explanations of this phenomenon have been offered, (among them the resistance of the air,) yet no cause has been assigned for it which is satisfactory to him. Even the cause of the electrical condition of the upper regious of the atmosphere has not, to Professor Faraday's opinion, been satisfactorily explained; for though evaporation by some, and different states of temperature by others, have been adduced as the cause, he thought it was better to admit ignorance than to mislead by unsatisfactory explanations. The long continued peals of thunder resulting from one instantaneous flash of lightning had been for some time a difficulty, but the difficulty vanished when it was considered that a flash of lightning may pass through one or two miles, and that sound travels comparatively slowly; so that the sound caused by the disruption of the air at the commencement of a flash of lightning, cannot reach the ear until several seconds after the first peal of thunder has been heard.

The identification of lightning with electricity has enabled us to place the force of lightning under control, and to conduct it safely to the ground, though in carrying into effect this principle, serious mistakes are frequently made by not having the conductors continuous. The destructive effects that may be produced by the smallest disjunction of the conducting wire, were illustrated by several experiments, and even when good continuous conductors are used, considerable danger may arise if they be not sufficiently large.

An exemplification of this effect was given by connecting a wire from the prime conductor, with several metallic articles in its course, to the earth, and though in this arrangement the sparks were passing freely through the wire, a jet of gas was inflamed on being brought near the metallic bodies with which the wire was connected.

The influence of induction was shown in a striking manner by mounting a very large metallic globe on an insulated stand, several feet distance from the electrical machine, and whilst sparks were being taken from the conductor, by a ball held near it, the electricity induced in the globe was sufficient to fire a jet of gas. The importance of taking into consideration the influence of induction, when in operation on the large scale of nature, becomes, therefore, the Professor observed, very apparent, and it is of the utmost consequence, it should be borne in mind, in the construction of powder mills, or of other buildings where inflammable materials are contained.

In his concluding remarks, Prof. Faraday adverted to an allusion he had made, at the commencement of the course, to the increasing infirmities of age, and the probability of his resigning; but he said he had met with so much indulgence during the delivery of his lectures, that so long as that indulgence was continued, he would not separate from them. This announcement was received with loud and hearty applause.

For the Journal of the Franklin Institute.

On the Location of Iron Furnaces. By MR. H. FAIRBAIRN.

At this time of depression in the iron manufacture of the United States, and the great improbability that the former high prices of iron will again be obtained, it seems to become a consideration for the American iron manufacturer how far there have been errors in the location of iron works, which may have been the cause of disadvantage in the competition with those British iron establishments which now undersell the native iron of Pennsylvania and the adjoining States; and how far the avoidance of these erroneous arrangements may yet contribute to the returning prosperity and the permanent profitable establishment of a great iron manufacturing interest in this quarter of the United States. Undoubtedly there lies open to the view of the geologist and the practical manufacturer, an immense future field for the making of iron in the regions in the vicinity of the Allegheny mountains, amongst the coal fields of the State of Pennsylvania, where exist, not the same varieties of coal only, but the same iron ores and limestone, as in the similar coal fields of Scotland, Staffordshire, and Wales. The carboniferous geology of Pennsylvania has become another confirmation of the great principle of Humboldt, that the general order of geology is the same all over the world.

But though there is every variety of coals in the interior of Pennsylvania as in the interior of the British lands, yet has there not been founded any one complete iron manufacturing establishment in the localities which answer to those of the establishments in Scotland and Wales. All the establishments in Pennsylvania are at a distance from the coal fields, and therefore under overwhelming disadvantages in the higher prices of coals, with other disadvantages in the disunited state of the processes of the manufacture, from the ore to the finished bars, rails, hoops, or sheets, all of which are made in the same locality in Great Britain, but nowhere in the United States. Yet on this concentration of the processes in the manufacture of iron all profit depends. It is in vain to compete with the iron manufacturer in Scotland or in Wales if more than one-half of the cost of the bar iron consists in the carriage of the coals and the pig iron through the State of Pennsylvania, all of which expense is saved to the iron manufacturer of Scotland or of Wales.

Thus a manufacturer of railroad iron, in Wales, smelts his pig iron from the ore, puddles and refines the iron into bars, and mills the bars into railway iron, all with the coals dug at the door of his establishment, with the same steam engine throughout all the processes, by the same supervision, in a shorter period of time, with all the other advantages arising from the concentration of capital and labor, in a manufacturing system established on an extensive scale. These are the advantages, and the only advantages, of the iron manufacturer in Wales, and this is the reason that railroad iron can be imported on cheaper terms into the city of Philadelphia than any which yet has been manufactured in the United States.

There are altogether about 14 rolling mills in the United States, and these are almost all closed at the present time. Of these establishments two only, one on the Susquehanna and one on the Schuylkill river, manufacture railway iron through all the stages from the iron ore to the finished rail; and these two establishments are at a distance so great from the coal fields, that all the coals are used at a cost of \$3·50 to \$3·75 per ton of anthracite coal, and, including the still higher prices of any semi-bituminous coal employed in the puddling furnaces, the price of the coals is fully \$4 per ton. These are the best and the only complete establishments in Pennsylvania, the other rolling mills being lower down the Schuylkill river, or in the city of Philadelphia, or they are even so far distant as in New Jersey or the Northern States. All of these rolling mills use pig iron manufactured at a distance, subject to the expenses of carriage and many other expenses between the iron furnace and the rolling mill, and the mills are all worked with anthracite coal, at an average cost of \$4·25 per ton, or, with semi-bituminous coals, usually at a cost of \$6 per ton, as imported from the Susquehanna river, or from Virginia, or Liverpool, or Nova Scotia, and everywhere at similarly excessive prices for this leading material of the trade.

Estimating the result of this difference in the cost of the coals, it will be found that, to manufacture a ton of railway iron from the pig metal, will require for the process of puddling, refining, milling, and steam power, fully two tons of anthracite coal, or two and a half or three tons of semi-bituminous coals. The cost of these two tons of coals in Philadelphia, or at the average of the location of the existing rolling mills, will be not less than \$9, or \$5 above the cost of the same coals at Pottsville or elsewhere in the coal fields of the interior of the State.

But were there erected a complete iron establishment at or near Pottsville or Pinegrove, or any other vicinity where coals are at the cheapest rates, or about $2 per ton, then the saving would be $5 per ton in the coals required in the mere after processes of puddling and manufacturing the rails; but the previous savings would be more than double that amount on the coals which are required for the smelting of the iron from the ore, as compared to the least of the existing establishments, and the total difference would be $10 on a ton of railway iron manufactured in Philadelphia, or at the other average locations of the rolling mills which do not manufacture the iron from the ore.

Thus it is seen that a ton of railway iron could be manufactured $10 cheaper in the coal region than in any place where iron has yet been manufactured in the United States. This is an immense difference, and one which would turn the scale entirely in favor of the American iron manufacturer; and therefore to the coal fields we must direct our attention, for the discovery of the only true localities where iron can be profitably and permanently manufactured in competition with Scotland and Wales.

The coal fields of Pennsylvania and of South Wales are the same in geological formation, anthracite coal degenerating into semi-bituminous coals, and the siliceous carbonates of iron interlying everywhere the seams of coals. There is the same inexhaustible quantity of carbonate of iron in Pennsylvania, the same mountain limestone intervenes in the coal measures, and all the minerals are the same in the carboniferous regions of the old and the new world. The anthracite iron furnaces in Wales are in the vicinity of Swansea, which answers to Pottsville, and the main body of the furnaces are at Merther Twydwell, which is on the semi-bituminous coal formation, and answers to the country about Pinegrove and further towards the west. The iron ores have been found by Mr. Cowling Taylor and other eminent surveyors, to be precisely the same in the coal regions of Pennsylvania and of Wales.

Whilst the main considerations are thus the same in both countries, there are other advantages which seem to be greatly in favor of Pennsylvania, and amongst these is the greater accessibility to the superior iron ores in Pennsylvania than in Wales; for it is to be borne in mind that all the iron manufactured at this time in Wales is of an inferior description, in consequence of the inferiority of the ores, and this disadvantage applies also to the one or two iron furnaces which have yet been erected in the Pennsylvanian region of coals. From hard silicious iron ore only a tough unmalleable and cold short iron can be made, and the richer hematite ores are indispensable for admixture with the silicious ores of Pottsville or of Wales. But in Wales these hematite ores can only be obtained from the north of England, and their expense is so great that this circumstance now threatens the most serious consequences to the trade of Wales. A ton of hematite ore cannot be brought from Ulverston to Merther Twydwell at a cost of less than 28*s.* per ton, and yet so important is it to have hematite for admixture with the native ores, that the character of the Welsh railroad iron is rapidly degenerating in foreign markets, by reason of the impossibility of affording the importation of these ores at the prices for railroad iron which can only now be obtained, in consequence of the low prices established on the Clyde. One eminent firm at Merther Twydwell formerly imported 6000 tons of hematite ore from Lancashire, and this was the cause of the high character of the iron made by that company; but it is certain that this expensive ore can no longer be obtained when the contract prices of cargo iron have fallen to the present ruinous rates in Wales. Thus it is that the Welsh railway iron is losing its reputation in the markets of the United States, for the absence of the former quantity of hematite ore in the iron causes the rails to be cold short in quality; they are consequently brittle, and become fractured, laminated, and worn out in a comparatively very short time, being considered to be $8 or $10 less valuable than the rails which can be supplied from the rail mills of the United States.

On the other hand, the hematite ores could be obtained at less than one-half of the expense, at Pottsville or at Pinegrove, as at Swansea or any other place in Wales. The hematite, or hepatite, or other rich iron ores, are in boundless profusion in the hills at various distances from the coal regions of Pennsylvania; but taking the average distance at 50 miles, the cost would be only about $2 per ton above the iron ores raised on the spot. About one-quarter of the ore, as hematite, is the best mixture for railway iron, or in various other proportions for all varieties of bar iron, and we therefore see a very important advantage to Pennsylvania in the greater proximity, accessibility, and cheapness of the hematite ores as compared to Wales.

Having in this manner the certainty of the same carbonates of iron, the same limestone, and the same coals, with, also, the certainty of the superior ores at still cheaper rates, let it be now our inquiry how far there are other advantages, or disadvantages, respectively in Pennsylvania or in Wales.

When the improvident location of the iron furnaces may be overcome in the future iron manufacture of Pennsylvania, there will be comparatively few remaining advantages to the iron manufacturer of Wales; for the expenses of labor, though formerly very much higher in Pennsylvania, can no longer be said to be excessively different, as in Great Britain, for the vast influx of emigrants, skilled and unskilled, who are arriving from Europe, have already brought down the rates of labor very considerably below the rates of some few years since. There is found to be little real difference in the cost of mining coals, iron ore, or limestone, at Pottsville or at Merther Twydwell, the better levels in Pennsylvania saving much of steam power and expense for higher wages of miners; and respecting the labor about the furnace, this, in Great Britain, enters at the average rate of 4*s*. into the ton of iron, and allowing the difference to be 50 per cent. greater in Pennsylvania, this will be less than half a dollar per ton higher in Pennsylvania than in Wales. There have always been very exaggerated opinions respecting the difference in the cost of the labor in the iron manufacture in Great Britain and in the United States.

On the other hand, the higher prices of labor are far outweighed by the lower rental of mineral lands in the United States. In Wales or in Scotland, the royalties or rental of minerals enter into the cost of a ton of bar iron at the rate of 10*s*. to 14*s*. sterling, or about 25 per cent. upon the whole cost of the iron, but in Pennsylvania, the rent of the coals, iron ore, and limestone, would not be more than one-half of the same sum per ton of iron, since the coal fields are so extensive, and all property is so much lower in value than in Great Britain, that ages must pass over before any important rise can be anticipated in the value of coals and of mineral lands in the United States. Respecting the relative value of capital and interest of money, there is also a continually less advantage in favor of the British manufacturer, for the value of money is daily becoming more equalized, by reason of the favorable balance of general trade which has been established since the repeal of the Corn Laws of England, and the consequent large payments for the bread-stuffs of the United States. Some advantage still remains to the British manufacturer, but the amount of the difference on the annual interest of money invested in iron works in Pennsylvania, or in Wales or Scotland, would be found to be an unimportant consideration where there was otherwise a well-located and well-conducted iron establishment in the coal regions of the United States.

There would thus be many and great advantages in changing the location of iron works, and in the concentration of the various processes, from the iron ore to the finished bars or railway iron, which cannot now be made in competition with the iron brought over the Atlantic Ocean, and from places not even so well situated for the manufacture as are the coal regions of the United States.

If the iron manufacturer in Wales, or in Scotland, were to smelt his iron with coals brought from Newcastle-upon-Tyne, and costing 28*s.* per ton, and were to bring his pig iron from Staffordshire, he would be only doing that which is daily seen in Pennsylvania, in the use of Liverpool or Sydney coal, and of Scotch pig iron, in the rolling mills of the Schuylkill river, and he consequently would cease to be able to compete for the supply of iron to the markets of the United States. The carriage of coals for even a few miles has been found to amount to an annual expense which has been fatal to some branches of manufacture in Great Britain, and this consideration is all important with those who are aiming at the restoration and permanent foundation of the great iron business which Nature so evidently has intended to exist in the Allegheny regions of the United States.

Only the finer branches of the iron manufacture can exist in cities, or in localities distant from the supplies of coal. In Liverpool there are large foundries, and a great steam engine building business is carried on, but the heavier parts of the engines are brought from places in the Midland counties, and only the finer parts of the work are manufactured in Liverpool; whilst in London, although myriads of people are employed in manufactures of which iron is the raw material, yet it is in cutlery, in fine castings, and the thousand divisions of business in which the raw material does not enter so largely into the manufactured article as does the skill of the artizan, the presence of the metropolitan market, the fashion, foreign demand, and many other considerations which favor manufacturers in cities and towns. But a bar of railway iron was never made in Liverpool or in London, and none can be profitably made in Philadelphia, which is the Liverpool of the United States. Foundries, cutleries, and all other skilled iron manufactures of endless varieties, might be established with the greatest advantage in Philadelphia, but the pig iron, the bar iron, railway bars, beams for steam engines, and all other heavy and comparatively cheap iron and iron manufactures, only can be furnished from the places where fuel is to be obtained at the lowest rates.

These considerations are now of compulsory importance in the iron interests of Pennsylvania, as it is vain to live in hope of the return of those high prices of iron which rendered the manufacture of bars profitable in almost any situation, or at any price for coals. The iron manufacture of Scotland is extending against all the adverse circumstances of Great Britain, at this time of commercial depression through the world, and bar iron is becoming amongst the foreign exports of the Clyde. There are advantages in Scotland superior to those of Staffordshire or of Wales, for the hematite ores of Lancashire and Cumberland are almost close at hand for importation to the Clyde, and the position of the iron works of Glasgow is nearer to the Western coast of England, and to the United States and the general foreign markets, and there are, therefore, reasons for apprehending the total destruction of the great iron manufacture of South Wales, and the permanent establishment of low prices of iron through the world.

But when we see that, in Pennsylvania, there are all the grand advantages existing equally as in Scotland, in the coal fields, the iron ores, the limestone; all at lower rates of rental and equal rates of mining; labor not materially higher, and capital not materially more valuable; with every prospect that the advantage will continue to grow greater to the iron manufacturer of Pennsylvania, in both capital and labor; that there is now, and always may be expected to remain, a custom house duty of 30 per cent., or some other important sum, against the foreign iron manufacturer, with the freight and charges across the Atlantic Ocean, and other advantages, it cannot be doubted that the iron manufacture can be established on the most solid permanent foundation on the coal fields of the Central State of the United States.

For the Journal of the Franklin Institute.

The Screw Propeller.

"An ounce of Fact is worth a pound of Fiction."

In perusing the article on screw propellers in the last number of the Journal, by "Helix," I gather the following points as being what he wishes to be understood as advocating:—

1st, That propellers, running, as they do, at a higher velocity, admit of the use of smaller engines, thereby causing a saving of space and weight, as well as being cheaper in first cost.

2d, That the slip of the propeller is but 15 to 18 per cent.

3d, That the machinery of propellers, being of less weight and bulk, will allow of a less draft of water, and thereby materially reduce the resistance and increase the speed of the vessel.

4th, In heavy weather, at sea, the advantages of the propeller over the side wheel are very marked; for, while the former is working with uniform power, the latter are being alternately immersed to a great depth, and entirely raised out of water, causing the vessel to *yaw* from side to side, &c.

5th, The propeller, as now used, is not *properly constructed.* The numerous failures that have taken place are caused by a want of knowledge and calculation of the relations which should exist between the means and the end.

After reading the above, one may well inquire by what right a Cunard steamer crosses the ocean in 10 days? or further, why, with a west wind all the way, she arrives at all, instead of a day or two behind time, when she ought to be at sea, *yawing* about, with one wheel in the water and the other *out?* And what is still more presumptuous on their part, the slip of their wheels is but 15 to 20 per cent. Now if we only consider that a portion of the wheel, according to "Helix," is being *dragged* through the water, and the *balance* operating at an angle, and not in a direction opposite to the motion of the vessel, I think we may well say that *that small portion* of the wheel that does the work is entitled to great credit for the exceeding regularity of its performance; and if that portion that *drags* should be cut off, what might not be expected even from side wheels?

In making a comparison between the engines of propellers and side wheel steamers, "Helix" very modestly takes direct action engines for the former, and gives side lever engines to side wheels, although he very well knows (if an engineer) that direct action engines are in common use for side wheels in England, and that, in the very case he has stated, a vessel of 900 tons may have oscillating engines in the space he has given to those for the propeller. I do not claim, however, that proper engines for side wheels can be put in the same space that some form of engines for propellers may be made to occupy, but the difference in space is very far from being what "Helix" would make it appear, and when the following points are considered, all of which *I am prepared to establish* by testimony that will not be questioned even by "Helix," I think that the friends of side wheels may venture to breathe more freely, at least until they are again demolished, or until the appearance of a screw propeller *properly constructed.*

1st, That the models of vessels with the screw are, of *necessity*, cut away at the stern, and that this reduction of displacement is from 5 to 10 per cent. of the capacity of the vessel, and that the loss of stowage from this necessary evil is greater than the difference of size and weight between the engines of the different vessels.

2d, That the loss of steam by the use of small engines running at high velocities, as recommended by "Helix," is *double* what it will be in a paddle wheel steamer of the same size.

3d, That propellers do not admit of a lighter draft of water than side wheel steamers, it being a well established fact that even moderate success with them is connected with more than the ordinary draft for vessels of the same class using side wheels.

4th, That in no case has the screw any advantage over the side wheel as a means of propelling; that with the wind abaft, abeam, or ahead, the side wheel is the best; and that its advantages are most fully seen with the wind ahead, that being the point where all *theoretical* screw men claim the advantage; and in proof of this I adduce,

5th, That the slip of all sea propellers in this country, in heavy weather, with wind ahead, is from 50 to 60 per cent., as shown by their authentic log books. That the "Princeton" will fall off but 4 revolutions of her engine (from 32 to 28) with the wind ahead, while her speed will be reduced from 8 to 4 miles per hour; while the "Mississippi," under similar circumstances, will fall off from 14 down to 7 revolutions; and that while in the "Princeton" they will be using all the steam they can make, in the "Mississippi" they can run with the fire of two boilers banked up.

6th, That what is true about the "Princeton" is also true of the "Legare," "Massachusetts," and all sea propellers where authentic logs are kept.

7th, That the wear and tear of engines for propellers, from their high velocity, far exceeds that for side wheels, being a liberal per centage on treble the difference of cost.

8th, That the side wheel steamers running from New York to Savannah average their trips in less time than the propellers from this port to Charleston, although the difference in distance is 8 to 10 hours in our favor.

9th, That the paddle wheel of to-day is the same as used by Fulton in 1807, and that while, by its aid, we can with certainty cross the Atlantic, and with a regularity and speed that almost surpasses belief, the best efforts of all the *genius* and *talent* of the various advocates for propellers, in this country and in Europe, has not produced a sea steamer of *speed.*

No one is more willing than myself to admit that, for some particular services, propellers may and will be used to advantage. But for packets, steamers to Europe, or sea steamers to any port where speed is an object, and there is any opposition, side wheels will be preferred, defective as they are stated to be. "Helix" *must go to sea;* he must try a passage on both kinds of vessels, in heavy weather if possible, and I think he will agree with me, that the extremity of a sea vessel is not the place for the propelling power. H.

For the Journal of the Franklin Institute.

Particulars of the Steamship "Republic."

This fine steamer, recently finished at Baltimore, and now running between that port and Charleston, is deserving of particular notice, as being the first vessel built in this country with oscillating engines. Her dimensions are as follows:—

Length on deck, 207 feet; breadth of beam, 30 feet; depth of hold, 18½ feet; average draft of water, 11 feet 9 inches; 2 cylinders, 54 inches diameter, 6 feet stroke; diameter of wheel, 25 feet 6 inches; length of paddles, 8 feet 9 inches; depth of ditto, 2 feet 3 inches; dip of ditto, 3 feet 2 inches; average revolutions, 14 per minute at sea; average pressure of steam, 5 lbs. at sea, cutting off at half stroke; fuel per hour, 1680 lbs. of Cumberland coal, with natural draft; 2 boilers, 12 feet wide, 18 feet long, and 8 feet 6 inches high, with 4 furnaces each.

For some years past this form of engine has been coming into favor in England, and it is now used by a large number of river and sea steamers in private service, as well as by many vessels of the British navy. The advantages of the oscillating engine are simplicity, compactness, and a great reduction of weight.

The engines of the "Republic" occupy in the vessel but 10 feet in length, by 20 feet in width, while the ordinary side lever engine would have taken 25 feet in length. This saving of space gives a material increase of room for freight and passengers, and I am credibly informed that the saving in this particular is equal to the expense of coal for the trip. Messrs. Murry & Hazlehurst deserve great credit for their exertions in behalf of this form of engine, as well as for the manner in which they have executed the work, and it is to be hoped that the Navy Department will be induced to give the oscillating engine that consideration which it deserves.

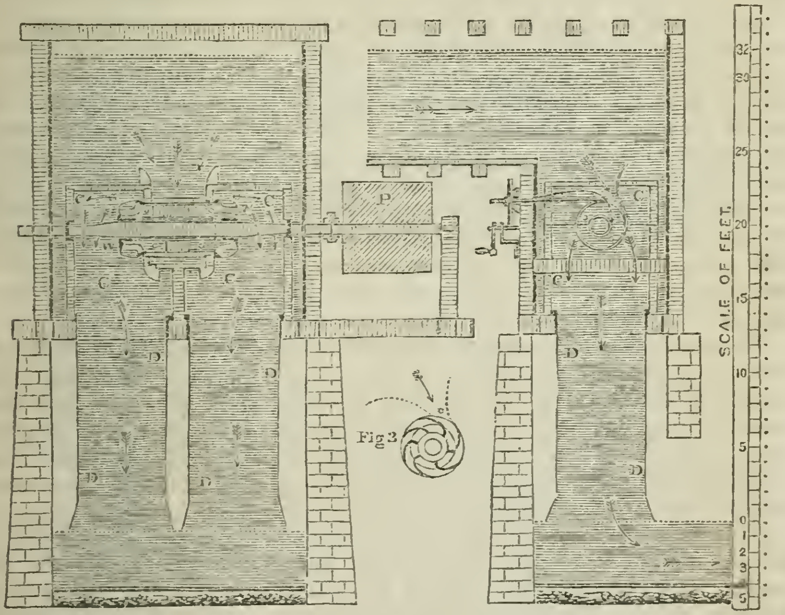
B.

For the Journal of the Franklin Institute.

Parker's Water Wheel.

This important improvement is now extensively in use in nearly every State in the Union. By the most careful scientific tests, and by observations in many instances in which it has been substituted for over-shot and high-breast or pitch-back wheels, it has been fully proved to be more effective in point of economy of water than gravity wheels; while its simplicity, its not being impeded by backwater, or obstructed by ice, its convenience of arrangement for inspection and management, the smallness of the space it occupies, its great durability, its not being liable to get out of order, and its cheapness, especially for great powers, are important advantages not possessed in an equal degree by any other motor.

Fig. 1. Fig. 2.



The above figures represent one of these wheels recently established in the Agawam Canal Company's Cotton Mill, at West Springfield, Mass., fig. 1 being an elevation or vertical section through the axis of the wheel; fig. 2, an elevation across the shaft, representing a section of the penstock and draft tubes, and a profile of the helical inlet; and fig. 3, a section through one of the wheels or rims, showing the form of the curved vanes or buckets. The parts of the drawing have their true proportions according to the scale.

The fall of water operating the wheel is 31 feet; its full power is estimated at 250 horse power, with an expenditure of 6396 cubic feet of water per minute. The wheel consists of a pair of reaction wheels or rims, *w*, of a modified and improved form, arranged on a horizontal shaft, and a double helical sluice, *o*, which conducts the water into the wheels with a lively annular motion in the direction in which the wheel moves. The wheel, with its helical sluice, is placed within the penstock, or reservoir supplying it, and is entirely surrounded with water, the extremities of the shaft only protruding from the sides; its axis is 20 feet high from the surface of the tail water. The water passes from the wheels or rims into two air-tight chambers or cases, *c*, called "draft boxes," from which it passes into two air-tight iron tubes, *d*, called "draft tubes," which terminate and discharge the water beneath the surface of the lower level. The air being entirely excluded from these draft boxes and tubes, and their sections being many times greater than the aggregate openings of the wheel, the water within them descends slowly, being held up by the pressure of the atmosphere on the lower level. It consequently acts by its gravity in giving the water force and velocity, in its passage through the helical inlets and wheel, as effectually as it would if it were over the wheel and acted by its pressure as head water. The wheel is 40 inches in diameter, and, at its proper working speed, makes 220 revolutions per minute. The power is transmitted directly to the line shafts of the mill by belts, from drums or pulleys, *p*, on the extremities of the shaft of the wheel. The drums are 6 feet in diameter, and the pulleys on the line shafts 10 feet; the belts consequently travel at the rate of 4148 feet per minute, or a little more than 47 miles per hour, giving the line shafts 132 revolutions per minute. With the gate, *t*, (which admits the water to the wheel,) a little more than half drawn, the wheel drives with full speed 7000 throstle spindles, and about half of the additional line shafting necessary for the balance of 16,000 spindles, (the number the mill is to contain when filled,) a number of iron and wood lathes, circular saw, &c.

The water required to effect this is about 4500 cubic feet per minute. From a comparison of this result with that of wheels previously erected for propelling cotton mills, working with the gate partly drawn, it is confidently anticipated that the full power of the wheel will drive 13,000 spindles. The Company expect to attach machinery sufficient to require the whole power in the course of a few months. The whole cost of the wheel, with all the parts pertaining to it, was about $5000.

This wheel was substituted for a pitch-back or high-breast wheel, 32 feet in diameter and 17 feet wide, which was operated by the same fall of water. It was made almost entirely of iron, the buckets and soling only being of wood. The quantity of water required to propel it was estimated at 4800 cubic feet per minute. The greatest power that could be got from it was only sufficient for 5000 spindles; another thousand was attached, but it could not be made to drive them with sufficient speed. It was erected early in the present year, and, after running about three months, constantly requiring expensive repairs, it was deemed expedient by the company to remove it, and substitute one of Parker's, which, as yet, appears to the directors and managers of said company to possess many very superior advantages, as compared with the old wheel, there being much less liability to failure. Another important advantage is in getting up the required speed for the machinery without the use of intervening gearing; thus saving a heavy expense in repairs, and a large amount of oil.

Parker's wheels, in the form here represented, are now in operation in the mills of the following proprietors, to whom those interested are referred for a confirmation of what is here stated.

	Horse power.	Feet fall.
T. F. Plunkitt, Pittsfield, Mass., Cotton Mill,	65	14
J. Barker & Brother, Pittsfield, Mass., Casinet Mill,	15	11
Plattner & Smith, Lee, Mass., Woollen Mill,	45	9
Glendale Woollen Co., Stockbridge, Mass., Woollen Mill,	65	14
Berkshire Woollen Co., Great Barrington, Mass., "	45	9
White & Sheffield, N. Y. City, or Jos. Kingsland, Saugerties, N. Y. } Saugerties, Paper Mill,	140	26
Jos. Bailey, Douglasville, Berks Co., Pa., Rolling Mill,	65	14
New Brunswick Manufacturing Co., J. Stark, Agent, New Brunswick, N. J., Cotton Mill,	38	12
Agawam Canal Co., D. Jakeworth, Agent, West Springfield, Mass., Cotton Mill,	250	31

With the exception of the last mentioned, these wheels have been in operation from one to five years, and so far as has come to the knowledge of the writer, neither of them has required repairing to the amount of a single dollar, nor been out of working order for an hour, since they were first put in operation.

The wheels are manufactured and sold by James T. Sutton & Co., Kensington, Philadelphia county, Pa., O. H. P. Parker, Agent; and by McKay & Hoadley, Pittsfield, Mass., H. D. Burghardt, Agent and Millwright.

Philadelphia, September, 1849.

Report on the Causes of the Explosion of Steam Boilers.[*]

The Rumford Committee, having examined the paper submitted by James Frost, Esq., of Brooklyn, New York, and entitled "Description of the Causes of the Explosion of Steam Boilers, and of some newly discovered properties of heat and other matters, for the purpose of showing that the application of steam for the production of motive force is susceptible both of immense improvement and economy," respectfully report:

The chief points which the author claims to have established are,—

1st, That steam of 212° Fahr., heated, out of contact with water, to 216°, doubles its volume; and heated to 228°, increases its volume threefold.

2d, That steam of low tension, heated to somewhere about 650°, is converted into another body, which the author calls "stame," and which, under favorable circumstances, becomes six times as effective as steam not so heated.

As, in the view of the author, the question of discovery rests upon the truth of the first of these two propositions, the attention of the committee has been particularly directed to its consideration. To this end, the apparatus employed by Gay-Lussac, in his determinations of the tension of aqueous vapor at different temperatures, was constructed, and a series of experiments made upon steam heated, out of contact with water, from the boiling point to 233·6°. The results arrived at were as follows:

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[*] Proceedings of the American Association for the Advancement of Science. Second Meeting. Held at Cambridge, Mass., August, 1819.

A volume of steam at 212° Fahr., measuring 15·80 cubic centimetres, or 1580 parts, heated to 216°, became 1600 parts, and heated to 228°, became 1630 parts. According to Mr. Frost, 1580 parts at 212° should have become 3160 parts at 216°, and 4740 parts at 228°. In tabular form we have, at

	Exp.	Frost.	Dif.
212°	1580	1580	——
216°	1600	3160	1560
228°	1630	4740	3110

The results for higher, intermediate, and lower temperatures, are given in the accompanying table. The whole expansion of the steam, when heated from 212° to 228°, was a little more than one-thirtieth of its volume at 212°. According to Mr. Frost, it should have been more than ninety times as great as the committee found it to be.

The experiments of the committee were made with steam under a pressure ranging from 24 to 24½ inches of mercury: that is, under less than atmospheric pressure. This condition could not influence the result unfavorably to the view of Mr. Frost, since the less the pressure, the greater is the expansion with a given elevation of temperature.

Centigrade.	Fahrenheit.	Volumes.	Centigrade.	Fahrenheit.	Volumes.
112°·0	233°·6	1644	102°·0	215°·6	1600
111·5	232·7	1642	101·5	214·7	1598
111·0	231·8	1640	101·0	213·8	1592
110·5	230 9	1638	106·5	212 9	1588
110·0	230·0	1634	100·0	212·0	1580
109·5	229·1	1632	99·5	211·1	1574
109·0	228·2	1630	99·0	210·2	1560
108·5	227·3	1628	98·5	209·3	1510
108·0	226·4	1626	98·0	208·4	1430
107·5	225·5	1624	97·5	207·5	1280
107·0	224·6	1622	97·0	206·6	1130
106·5	223·7	1620	96·0	204·9	870
106·0	222·8	1618	95·0	203·0	650
105·5	221·9	1616	94·0	201·2	550
105·0	221·0	1614	93·0	199·4	350
104·5	220·1	1610	92·0	197·6	200
104·0	219·2	1608	91·0	195·8	150
103·5	218·3	1606	90·0	194·0	125
103 0	217·4	1604	70·0	158·0	000
102·5	216·5	1602			

The committee deem it unnecessary to consider farther the claims of the alleged newly discovered properties of heat, as set forth in the pamphlet of Mr. Frost.

E. N. Horsford, *Chairman.*

Report upon an Improvement in Steam Boiler Furnaces, by Henry F. Baker, of Boston, Massachusetts. By Thomas Wicksteed, Esq., *Civ. Eng., Hon. Mem. Royal Cornwall Polytechnic Society, &c.**

Upon the 16th ult., Mr. Amory, agent of the trustees of Baker's furnace, called upon and showed me drawings of the above furnace, and gave me a pamphlet to read which contained a general description of the furnace, and also certificates from several American engineers, testifying the great economy in fuel obtained wherever the new furnace had been introduced, and wished to have my opinion as to its superiority over the furnaces in general use.

I told him that the introduction of "the semi-elliptical chambers or retorts," (instead of straight bridges,) causing "the fire" to be "reverberated upward and backward," was new to me; and that, inasmuch as it checked the draft and retained the heat for a longer period at that part of the boiler where it would produce the greatest effect, I thought a great saving might be obtained over the furnaces in ordinary use; that in fact, by this plan it appeared to me that, with a simple cylindrical boiler of 30 or 40 feet in length, with the chimney immediately at the end of the *first* flue, the same effect would be produced as in the Cornish boilers, where the flues were carried, first, through the inside of the boiler to the farthest end, thence along the sides externally to the front, and thence back again along the under side of the boiler to the chimney; the flame or heated air having, therefore, to traverse the boiler *three* times; and that, if this were the case, the saving in *the first outlay* upon *boilers* and *buildings* would be very considerable, in addition to the annual saving in fuel.

Mr. Amory was very desirous that I should try the new furnace upon the Cornish boilers belonging to the East London Water Works Company. I suggested that, as the principle of slow combustion had been carried out so much farther than usual in the furnaces at Old Ford, it would scarcely be a fair trial; because the combustion was already so slow, that while the fire-doors were open for firing, the flame and smoke came out into the stoke-hole; but that, if he was determined to have a trial made, he must not expect the saving, if any, to be at all equal to that obtained by the introduction of the new furnace into works of the ordinary construction. He, however, resolved to have the trial made; and the result has proved that a considerable saving has been effected, and that he was therefore wise in trusting to this trial.

I may here observe that the statements, published in the pamphlet referred to, showing the very great saving effected in America, should not be rejected without examination, *because* they show very great, and perhaps to some, almost incredible results; the question is not what *per centage* of saving has been effected, but what is the amount of the *ultimate result* obtained. If this be *greater* than experience has hitherto shown, there may be some reason for doubt; if it be not, why should the statements of saving be considered incredible? Now it appears that at three trials, made at three different works, viz., 1st, at Messrs. Heywood & Carne's establishment in Charlestown; 2nd, at the Dry Dock, Navy Yard, at Charlestown; 3rd, at the Portsmouth Cotton Mills; the weight of water evaporated from 212° was, *before* and *after* the introduction of the Patent Furnace, respectively as follows:—

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* From the London Mechanics' Magazine, for May, 1849.

	Before.	After.	
No. 1.	7·367	11·890	showing a saving in fuel of 61 per cent.
No. 2.	7·558	8·782	" " " 16 "
No. 3.	6·260	8·500	" " " 35 "

In the first two experiments the coals used were anthracite, and the mean of the two trials will show that 10·336 lbs. of water were evaporated from a temperature of 212° by 1 lb. of anthracite coal; in my experiments, published in 1841, 10·203 lbs. of water were evaporated from a temperature of 212° by 1 lb. of anthracite coal. According to the first report of the royal commissioners "upon Coals suited to the Steam Navy," lately published by Parliament, it appears in Table No. VI., page 15, that they found that 1 lb. of anthracite coal evaporated 9·46 lbs. of water from 212°; and they further observe that a Cornish boiler may evaporate 20 per cent. more than the one used by them in their trials. If this be correct, the water evaporated would be (see Table X., Appendix to their Report) equal to 11·34 lbs. Now taking the average of my experiment, the Commissioners', and the Cornish, the result will give a mean of 10·331 lbs., which happens to be identical with the mean of the two American trials.

As regards No. 3, the description of coal is not given; and in the account of the trial made at the Eagle Furnace, in Albany, the work done previous to the introduction of the new furnace is not given, and therefore no comparison can be made; nor should I be satisfied with the accuracy of a result obtained upon so short a trial as one of thirteen hours' duration. As the ultimate amount of evaporation, given in the three experiments quoted is, therefore, not improbable, there can be no reason for rejecting those statements *because* the saving obtained is so considerable, even as much as 37 per cent. upon the average of the three trials.

Having undertaken to try the effect of the new furnace, as regarded the saving of fuel to be obtained, I have been several weeks prosecuting the inquiry, which was perhaps a longer time than might be considered necessary; but having, from experience, ascertained that *short* experiments are comparatively valueless, I would not undertake to give an opinion without ample time being allowed me; and when it is considered that a variation in the quality of coals from the same heap, their state of dryness, the level of the water in the boiler at the beginning and termination of an experiment, (which, in a high pressure boiler when supplying a steam engine, is, from the oscillation that takes place, very difficult to determine with accuracy,) the state of combustion of the fuel at the beginning and end of a trial, the temperature of the feed water, &c., may and does lead to the most erroneous conclusions, I think it will appear evident that but little reliance can be placed upon *short* trials, and that where there are so many points to be carefully attended to, the longer the duration of the experiments, the greater will be the accuracy obtained. The *shortness* of the trials made *previous* to the adoption of an invention, accounts for the constant disappointments that manufacturers are exposed to, when, after expending large sums of money with the view of obtaining an advantage, they find, after a *longer* trial and further experience, they have not obtained the promised advantages. A short trial is therefore an injustice to the manufacturer, and it is equally so to the honest inventor, whose plans may thus be rejected on too slight grounds.

I have made these remarks at this length, in order to satisfy the parties for whom I have been making the experiments herein reported; and although I have been cautious in experimenting, and perhaps, also, slow in believing that any saving of fuel could be made by introducing their furnace into the boilers in question, nevertheless this precaution will be of advantage to them, for I think they may fairly conclude hereafter, that if, in some instances, no benefit is derived from the introduction of their furnaces, in such cases the failure may be attributed to some other cause than a defect in the invention.

The experiments were tried upon three Cornish boilers; the outer cases being 6 feet 6 inches diameter, the fire-tubes 4 feet in diameter, and the lengths being 34 feet.

The following regulations were adopted, viz:—

The coals were weighed out every twelve hours.

The clinkers and ashes were weighed every twelve hours.

The temperature of the feed water was taken every hour, day and night.

The water was measured by a metre into the boilers, and the counters were taken every twelve hours; the counters of the engine being taken every twelve hours also; for, as the weight lifted by the engine every stroke was the same, its working formed an admirable *check* upon the other observations.

I made several experiments upon the consumption of fuel with different quantities of air admitted into the flue through the bridge, and the one recorded was the best, each opening in this case being equal to 9 square inches, or, in the aggregate, 27 square inches.

The two experiments recorded in detail were, first, with three boilers *without* the new furnace; and secondly, the same boilers *with* the new furnace.

The coals used were *small* Newcastle coals of *inferior* quality.

Detail of Trial and Results.

	Experiment without the new Furnaces.	Experiment with the Furnaces.
1. Duration of experiment,	207 hours.	108 hours.
2. Coals consumed,	64,940 lbs.	31,642 lbs.
3. Ditto, per hour,	313 lbs.	293 lbs.
4. Water evaporated,	449,320 lbs.	243,860 lbs.
5. Ditto, per hour,	2,170 lbs.	2,256 lbs.
6. Temperature of water before entering boilers,	95·5°	90°
7. Water evaporated per lb. of coals from initial temp.	6·919 lbs.	7·701 lbs.
8. Ditto; from 212° (latent heat 1000°)	7·725 lbs.	8·640 lbs.
9. Clinkers made,	2,597 lbs.	1,428 lbs.
10. Ditto, per hour,	12·50 lbs.	13 lbs.
11. Per centage of clinkers to coals used,	4 per cent.	4·50 pr. ct.
12. Ashes made,	1,298 lbs.	731 lbs.
13. Ditto, per hour,	6·25 lbs.	6·75 lbs.
14. Per centage of ashes to coals used,	2 per cent.	$2\frac{1}{3}$ pr. ct.
15. Coals *minus* clinkers and ashes,	61,045 lbs,	29,483 lbs.
16. Water evaporated per lb. of coals *minus* clinkers and ashes from initial temperature,	7·360 lbs.	8·265 lbs.
17. Ditto, from 212°,	8·217 lbs.	9·278 lbs.

A reference to the fifth line of this statement will show that the quantity of water evaporated per hour was somewhat greater *with* than *without* the furnaces; but it should be remarked that, had it been necessary to work with the dampers wide open before this invention was applied, this could not have been the case, as there is no doubt that a greater draft will be necessary where the new furnaces are applied, and in this case it became necessary to open the dampers wider.

The seventh line shows that, when taking the coals from the heap, *without* the furnaces, 1 lb. of coals evaporated 7·725 lbs. of water from 212°, and *with* the furnaces, 8·640 lbs. of water, or 11·8 per cent. *more* than *without.* And the seventeenth line shows, when taking the coals *minus* the *clinkers* and *ashes*, that, *without* the furnace, 1 lb. of coal evaporated 8·217 lbs. of water from 212°, and *with* the furnaces 9·273 lbs. of water, or 12·8 per cent. *more* than *without.*

In the experiments I tried, for the purpose of ascertaining what sized opening for admission of air would produce the best effect, I found when any of the air-holes in the bridges were *increased* rather more than one-third beyond those recorded, (27 square inches,) that the reduction in effect was 5¼ per cent., and when *reduced* rather less than one-third, the reduction in effect was 2¼ per cent. as regards economy in fuel; it would appear, therefore, that the areas recorded are about the best.

After this trial, which exhibits a saving of 11·8 per cent. of fuel in the Cornish boilers, I can have no hesitation in declaring, that the saving of 37 per cent. upon the average, stated to have been effected in the American establishments, has been effected, and that there are numberless cases in Great Britain where a similar saving might be produced.

I have thus far reported upon the advantages of the invention as an economiser of fuel, and not as a smoke-consumer or preventor; for although the smoke is undoubtedly diminished, not only on account of the reduction in the quantity of coals used, but owing to the air admitted through the bridge; yet there was not a fair opportunity of testing its merits as a smoke consumer or preventor, on account of the arrangement of the flues of these boilers; I believe, however, that with one straight flue to the chimney, as in the American furnaces, a much greater reduction would be effected. It may, perhaps, be as well to remark here, that the generality of boilers and furnaces are so badly constructed, that the waste of fuel and consequent increase of smoke is enormous; in any case, therefore, where the *only* objection to using any apparatus for the purpose of consuming or preventing smoke is the extra cost of fuel, this would be more than compensated for by an improvement in the furnaces and boilers; and if a reduction of fuel were effected by introducing slow combustion generally, I have no doubt there would be an average saving of 30 per cent. of fuel in the manufacturing establishments of this kingdom. This would cause an actual reduction of smoke in proportion to the fuel; but there is also no doubt that the reduction of black smoke evolved from the chimneys would be in a much greater proportion than the reduction in the quantity of coals, in consequence of the slow combustion.

East London Water Works.

JOURNAL

OF

THE FRANKLIN INSTITUTE

OF THE STATE OF PENNSYLVANIA

FOR THE

PROMOTION OF THE MECHANIC ARTS.

DECEMBER, 1849.

AMERICAN PATENTS.

List of American Patents which issued in the month of April, 1849, *with Exemplifications, by* Charles M. Keller, *late Chief Examiner of Patents in the U. S. Patent Office.*

Continued from page 387.

51. For an *Improvement in the Manufacture of Twine;* William C. Noyes, City of New York, assignee of Thomas G. Boone, Brooklyn, New York, April 10.

The patentee says,—"The nature of my invention consists in applying liquid glue or starch, or any convenient combination or composition of these or other analogous substances, to cotton threads or yarns separately, in combination with twisting said threads or yarns collectively into twine or small cords, while the threads or yarns are wet with said substances, thereby rendering the twine or cord more compact or strong than by any known process."

Claim.—"I disclaim the substances used as sizing separately, and I also disclaim the manner in which it is applied separately; but I claim the two processes combined: that is to say, I claim the saturating of the cotton yarns or strands separately, with gelatin, gluten, starch, or glue, or any convenient combination or composition of these or any other viscous or analogous substance, while in a liquid state, preparatory to, and for the purpose of, being twisted, and, in combination with the twisting the said cotton yarns or strands, while so wet and saturated at one operation, into twine or cord, thereby producing the results set forth; and therefore, by so twisting it, in combination with the saturating of the yarns at one operation, I both save time and expense in the process of manufacture, and at the same time produce a better article for the purpose of untarred wrapping twine than is produced by any other known process, thereby giving the article an internal saturation with these tenacious and preservative substances, which imparts strength as aforesaid, superior to a tar saturation, without the weakening and soiling properties of tar."

52. For an *Undetachable Swinging Bottle Stopper;* Arch. H. Forbes, City of New York, April 10.

Claim.—"What I claim as new, is the manner of closing the mouth of a bottle by means of the undetachable metallic cap, having cork or india rubber, or both, placed in the top of the same, and secured to the neck of the bottle by means of the ring, the joint pins, and the grooves in the bottle neck, in the manner set forth."

53. For an *Improvement in Churns;* Henry F. Baker, Centreville, Wayne county, Indiana, April 10.

Claim.—"What I claim as my invention, is the particular manner in which I have combined and arranged the parts, so as to adapt them to the churning of cream, as set forth: that is to say, I claim the combination, upon the same shaft, of two spiral float wheels, so arranged as to force the cream from the ends of the churn box towards the centre, as described."

54. For a *Folding Centre Board;* John M. Hoffman, Buffalo, New York, April 10.

The patentee says,—"The nature of my invention consists in constructing centre boards to be attached to flat bottomed vessels, which can readily be folded up, to allow the vessel to pass over a bar or shallow place, and may, without inconvenience, be unshipped at any time and taken on board, either to repair damages or for other purposes."

Claim.—"What I claim as my invention, is suspending in a jointed frame a centre board, composed of one or more pieces, capable of being turned with either their edges or sides to the bottom of the vessel, and with the frame folded up against, or projected down therefrom, as set forth, whether the several parts be arranged as described, or in any other similar manner. And likewise, hanging the above claimed apparatus so that it is capable of being turned obliquely across the keel, for the purpose of counteracting the lee-way of the vessel, as set forth."

55. For an *Improvement in Machines for Cutting Gaiter Boots;* William Snell, Easton, Northampton county, Pennsylvania, April 10.

Claim.—"I claim as my invention, the machine with heads, with or without a division, with patterns adapted to its use, consisting of cutting and moulding ladies' and gentlemen's gaiter and half-gaiter boots, to any size, of any material, without a seam; thereby saving fifty per cent. in labor, and surpassing the old plan in neatness and durability."

56. For an *Improved Air Engine;* Francis J. Lauberau, Paris, France, April 10; (anté dated October 30, 1847.)

The patentee says,—"The principle or character of my invention consists in making the plunger hollow, with its external and internal surfaces, made of some good conductor of caloric, separated by a non-conductor, the said plunger being adapted to move within a surrounding cooling vessel, and so combined with a heating vessel, made of some good conductor of caloric, and heated by the application of heat internally, that the said hollow plunger shall alternately cover and uncover it, and thus cause the contained air alternately to pass over the heated surface, to dilate it, and then over the cold surface, to contract it; the said surrounding vessel being in connexion with a cylinder or other vessel to which is adapted a working piston."

Claim.—"What I claim as my invention, is combining with the surrounding cooling vessel a hollow plunger, made with its external and internal surfaces of some conductor of caloric, separated by some non-conductor, in the manner and for the purpose specified. And I also claim the hollow plunger, as described, in combination with the heater which it alternately covers, as described, for alternately heating and cooling the air."

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57. For an *Improvement in Extension Tables;* Theodore Franck, City of New York, April 10.

Claim.—"I claim as new, the application to extension tables, of slides formed with alternate and interrupted tongues and grooves in the faces, to carry the weight off and on the table, and kept together by metal stops and slide-keeper pieces, having lips to operate in grooves on the edges of the slides, for that purpose, substantially in the manner described."

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58. For a *Revolving Cradle for Unloading Canal Boats or sections thereof;* John Elgar, Baltimore, Maryland, and Benjamin Hallowell, Alexandria, Virginia, April 10.

Claim.—"What we claim as our invention, is a revolving cradle, suspended on gudgeons, to receive and securely hold a boat, or section thereof; said gudgeons being attached either to a railroad truck, or the bail of a crane or other hoisting machinery, in such a manner that the cradle may be revolved to such an extent as to turn the boat or section upside down, as described."

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59. For *Improvements in Planes for Bevel Edges;* William H. Blye, De Ruyter, Madison county, New York, April 10.

The patentee says,—"The nature of my invention consists in attaching an adjustable hinged guard or fence to rebate, fillister, moulding, or other planes, by means of which the workman is enabled to bevel the edges of a piece of wood in an uniform manner, and at any given angle."

Claim.—"What I claim as my invention, is the manner described of planing the edges of pieces of wood of a beveled form, at given uniform or varying angles, by means of an adjustable guard hinged to the plane stock."

60. For a *Machine for Regulating the Twist and Diameter of Screw Augers;* Nath. C. Sanford and Lucius B. Smith, Meriden, New Haven county, Connecticut, April 10.

Claim.—"We claim as our invention, the raising upon, and securing to, the surface of level metallic or other plates composed of hard substance, wales or beads, running either in straight or curved lines, and operated substantially in the manner specified, for the purpose of forming and perfecting the twist of double and single twist augers."

61. For a *Sliding Cut-Off Valve;* Simon P. Winne, Albany, New York, April 10.

Claim.—"I claim the method of constructing and arranging sliding valves of steam engines, with their corresponding openings into steam passages, together with the regulating apparatus attached to said valves, so as to operate the cut off valves by the same rod which moves the eduction valves; also as to permit the adjustment of the cut-off valves in such a manner as to close the steam passages at various preconcerted portions of the stroke, by hand gearing, during the oporation of the engine; all in manner and form as set forth."

62. For an *Improvement in Fan Chairs;* Daniel Linzie, Petersham, Worcester county, Massachusetts, April 10.

The patentee says,—"My invention consists in combining bellows with rocking chairs or other seats, which bellows are operated by the motion of the seat, by a pedal acted upon by the foot of the occupant of the seat, or otherwise."

Claim.—"What I claim as my invention, is the manner described, of diffusing perfumes and producing currents of air, to fan and cool the occupants, of either stationary or rocking seats, by means of bellows and tubes, whether the several parts be arranged and operated as set forth, or in any other substantially similar manner."

63. For an *Improved Rotary Gold Washer;* Harrison Parry, Pittsburg, Pennsylvania, April 10.

Claim.—"What I claim as my invention, is the application and combination of the helix or screw with a revolving cylinder, and the short strips at the upper end of the cylinder, in the manner and for the purpose named."

64. For *Improvements in Planing Machines;* Hervey Law, Wilmington, New Hanover county, North Carolina, April 10.

Claim.—"What I claim as my invention, is combining with stationary cutters in a planing machine, reciprocating clamps, which increase their pressure as the resistance to the advance motion of the board increases, in such manner that said clamps give a rapid intermittent or reciprocating motion to the stuff, whereby the clogging of cutters is prevented, and smooth work secured, in the manner set forth.

"I also claim the passage and the scraper, arranged and operating as described, in the rear of the throat of the plane, for freeing the plane from stray shavings, and for preventing the clogging of the cutters, in the manner set forth.

"I also claim the gauging pressure spurs, placed in front of the plane cutters, for retaining the board in its due position in contact with the bed of the plane frame, as set forth."

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65. For a *Machine for Carving Wood or Metal;* Isaac M. Singer, Pittsburg, Pennsylvania, April 10.

Claim.—"What I claim as my invention, is combining with a rotating cutter, which has only an endwise motion for determining the depth of cut, as described, a compound sliding table, (which carries the material to be carved,) operated by a system of pentograph levers provided with a pointer or tracer, that all the motions given to the tracer may be communicated to the material to be carved, in the manner and for the purpose specified."

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66. For a *Machine for Making Suspender Buckles;* Wm. Scarlett, Newark, Essex county, New Jersey, April 10.

Claim.—"What I claim as my invention, is the combination of the toggle for holding the wire, and forming the recessed figure upon it, as described; the combination of the cross-head, arms, and levers, operating together, as described. I also claim the combination of the levers and pointers, arranged within the die, and acted on by the levers, for punching the holes in the ends of the bow. I also claim the safety-bar, operated by the cam against the toggles, for the purpose of keeping the toggles in their straightened position until the punching machine is withdrawn, and thereby permit the discharge of the finished bow, as described."

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67. For an *Apparatus for Drilling Sub-Marine Rocks;* Thomas Kendall, City of New York, April 17.

Claim.—"What I claim as my invention, is the adjuster, with its cap, lens, adjusting screws, elastic circles, and circular pads. I also claim the combination of the chamber with the adjuster, tube, adjusting pins, and with the guide posts, constructed and arranged as described."

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68. For an *Improvement in Bedsteads for Invalids;* Isaiah Buckman, South Woodstock, Windsor county, Vermont, April 17.

The patentee says,—"The nature of my invention consists in constructing a bed for sick or disabled persons, in such a manner that patients may be elevated and suspended at any desired height, for the purpose of being aired, and to ventilate and adjust the bed, that they may be changed from a lying to a sitting posture, &c."

Claim.—"What I claim as new, is, 1st, the combination of the adjustable suspension frame with the fixed frame, the several parts being made and arranged in the manner and for the purpose described.

"2d, The combination of the sheets, and the rollers upon which they are wound, substantially as described.

"3d, The combination of the shower box and steaming apparatus with the contained compartment, as described."

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69. For an *Improvement in Spectacle Frames;* Joseph James Low, Philadelphia, Pennsylvania, April 17.

Claim.—"What I claim as my invention, is making the temples of spectacles either in whole or in part hollow or tubular, of either a cylindrical, square, or any other shape; said temples operating in the manner and for the purpose set forth."

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70. For an *Improvement in Looms for Weaving;* Aug. Faulkner, Walpole, Cheshire county, New Hampshire, April 17.

Claim.—"What I claim as my invention, is the method as described, of withdrawing the wires from the raised warp or figuring of the fabric, carrying them forward and replacing them again in the shed, by means of rolls receiving their different motions from machinery arranged as set forth, or in any other substantially equivalent manner.

"I also claim giving to the shuttle-box a vertical alternating motion, for the purpose of directing the shuttle through the shed, alternately above and below the ground warp, when the ground warp remains constantly stretched in the same plane, and the shed is formed simultaneously with the elevation and depression of the shuttle-box, by the alternate deflexion of the covering warp above and below the ground warp, substantially as set forth."

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71. For an *Improvement in Distilling Apparatus;* George Riley, City of New York, April 17.

The patentee says,—"The nature of my invention consists in causing the wash beer, or other article to be distilled, to be subjected to the action of an ascending current of steam, passing up through a series of perforated plates of metal, soap stone, or other material, securely fixed in a steam-tight vessel, each plate being provided with a drop-plate and receiver below."

Claim.—"What I claim as my invention, is distilling and rectifying spirituous liquors and turpentine, by causing a current of steam to pass up through a series of perforated metal, slate, soap stone, or other plates, securely fixed in a steam-tight vessel, and provided with drop-pipes and receivers below, through or over which the wash or other article is descending; the apparatus therefor being constructed in the manner described.

"I also claim the use of slate or soap stone plates for this purpose, with or without the combination of the drop-pipes and receivers, made and used as described."

72. For an *Improved Method of Expanding Metallic Pistons;* James Touchstone and Jacob H. Clark, Philadelphia, Pennsylvania, April 17.

The patentees say,—"The nature of our improvement is the tightening of metallic pistons by a single movement of a wrench, or other equivalent moving machinery, so applied as to obviate the necessity of separating the parts of the piston by removing the follower, (as is done in the ordinary pistons hitherto used,) and at the same time insuring accuracy and promptitude of adjustment."

Claim.—"What we claim as our invention, is the setting out or tightening of metallic packings, by means of the series of cams, in combination with the sliding rods, and with the springs, when the whole are operated simultaneously by turning the single cam head or shank, in the manner set forth."

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73. For an *Improvement in Straw Cutters;* Israel J. Richardson, City of New York, April 2.

The patentee says,—"The nature of my invention consists in adapting the double motion of the gate to one revolution of the crank, by means of the interposition of the toggle joint, to the purpose of cutting straw."

Claim.—"What I claim as my invention, is the combination of the toggle joint with the crank shaft, for the purpose of operating the knife, and giving the double or accelerated motion as set forth."

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74. For an *Improvement in Corn Shellers;* Israel J. Richardson, City of New York, April 2.

Claim.—"What I claim as my invention, is, 1st, the projections or horns, with the angular notches between the horns and the front edge of the jaw, for removing the grains or rows of corn that pass between the angles of the jaws.

"2d, I claim, in combination with the jaws, the guides, constructed and operated as described, for stripping the grain from the cob, when moved forward by a piston or its mechanical equivalent."

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75. For *Improvements in Cog Gearing of Locomotives for Ascending Inclined Planes;* Wm. Hoyt, Dupont, Madison county, Indiana, April 17.

Claim.—"What I claim as my invention, is, 1st, the combination of the intermediate cog wheel with the pinion on the propelling axle, and stationary cogged rail, into which the intermediate cog wheel is made to match or gear when required for ascending inclined planes, said intermediate cog wheel being hung upon a movable shaft, and kept in gear with the rack by means of a weight or spring, whereby difficulties arising from the inequalities in the road, or others incident upon the use of a rack and pinion for ascending inclined planes, are avoided, as set forth.

"2d, I also claim the mode of locking, by the employment of the cog wheels S and T, in combination with the pinion and intermediate cog wheel and rack rail, as described."

76. For an *Improvement in Endless Bands for Grain Dryers;* John Massey, City of New York, April 17.

The patentee says,—"The nature of my invention consists in providing an endless belt or apron, made of sheets or plates of metal, to be revolved or pass over grooved hexagon metal rollers, for the purpose of carrying grain and such like substances through a hot chamber or kiln, so as to dry said substances, when another kind of endless apron, not made of metal, could not be used."

Claim.—"I claim the combination of an endless apron, made of various pieces of plate metal, constructed with joints, united by axles which project below the inner surface of the web or apron, with octagon or hexagon rollers, constructed with grooves in the said rollers, to receive the projection or axis of the endless apron, (meshing into one another,) the whole constructed and operated in the manner set forth."

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77. For a *Vibrating Sash Stopper;* William Ferrell, Mount Holly, Burlington county, New Jersey, April 17.

The patentee says,—"The nature of my invention consists in providing an indented or rack side to one side of the window sash, and providing an eccentric button catch in a recess in the window case, the which button is moved by a key which has a thin slide or head, guided in an escutcheon on the window moulding, that makes the said key thrust out the catch button, to hold down the window, by catching into the rack on the sash."

Claim.—"I claim the combination of the key with the escutcheon and the catch button, operating as described, to make the catch button project into the rack side of the sash, to hold or retain the window, as described."

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78. For a *Piston Valve Cut-Off;* Gordon McKay, Pittsfield, Berkshire county, Massachusetts, April 17.

Claim.—"What I claim as my invention, is the cut-off, composed of two cylindrical portions or rings, working steam-tight with the sides of the steam chest, and also fitting steam-tight when brought alternately in contact with the flat surfaces of two pistons, between which said cut-off works, whereby steam is prevented from passing into the working cylinder of the steam engine, while either the cut-off alone, or the cut-off and piston together, are passing by the steam passage, said cut-offs being moved by the pistons, and attached to each other in the manner described."

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79. For *Improvements in Machinery for Cutting Veneers, &c.;* E. B. Cherevoy, City of New York, April 17.

Claim,—"What I claim as my invention, is the method of cutting veneers, as described, by means of a knife, or knives, having a longitudinal sliding or vibrating motion during the operation of cutting, when this is combined with a box or boxes on a rotating shaft, that, by its revolutions, it may carry the block to and over the knife, as described, whereby the operation of cutting veneers, by means of a sliding or vibrating knife to give the draw cut, may be made continuous, as described.

"And I also claim the method, as described, of communicating the feeding motion to the follower or followers, in the feeding box or boxes, by means of the arm or arms, so connected with the main shaft, or the equivalent therefor, that it may have a motion independent thereof, and connected with the follower or followers, in the feed box or boxes, and operating as described, or in any other manner the same in principle."

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80. For an *Improvement in the Manufacture of Paris Green;* Theodore Schwartz, City of New York, April 17.

Claim.—"What I claim as my invention, is, 1st, the process of dissolving the blue vitriol, by pouring on it, while the vitriol is in a dry state, the hot saturated solution, in water, of arsenic and carbonate of soda, as described in paragraph B.

"2d, The process of dissolving the dry carbonate of soda, by pouring on it the hot saturated solution, in water, of the arsenic and blue vitriol, as described in paragraph G.

"3d, The combination of the process described in paragraph B, or the process described in paragraph G, with all the several steps above described and marked with the letters A, C, D, E, and F. And also the combination of either of the said processes, described in section B and section G, with any of the above named steps described in sections A, C, D, E, and F."

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81. For an *Improvement in Electric Telegraphs;* Alexander Bain, London, England, April 17; (anté dated December 12, 1846.)

Claim.—"I claim as my invention, 1st, the composing of electro-telegraphic communications, by making groups of perforations through paper, corresponding with, or representing, the signs to be transmitted, irrespective of the general arrangement of the collective or individual signs, and irrespective of the mechanical means employed to make the perforations.

"2d, The application of paper, so perforated, to open and close an electric circuit, or several successive circuits, thereby transmitting the electric current or currents in successive pulsations, that correspond with the perforations in the paper, substantially in the manner described and shewn, but including any merely practical or convenient variations of the mechanical means or materials or fabrics employed, that are analogous or equivalent in their operation and effects.

"3d, The application of any suitable chemically prepared paper, without regard to the chemical ingredients used for such a purpose, to receive and record signs, forming communications, such signs being made by the pulsations of an electric current or currents transmitted from a distant station, said current operating directly, and without the intervention of any secondary current or mechanical contrivance, through a suitable metal marking style that is in continuous contact with the receiving paper, thereby making marks thereon, which marks correspond with the groups of perforations in the paper composing the transmitted communication, or may be given by the pulsations from the spring and block; so that, in either case, these form the received communication, in the manner described, and with the effects shewn, including any merely practical variations analogous and equivalent in the means employed and the effects produced."

82. For an *Improvement in Hooks and Eyes;* William Benjamin, Jr., City of New York, assignee of Henry McEvoy, Birmingham, England, April 17; (anté dated May 27, 1847.)

Claim.—"I claim the constructing of hooks with a projecting piece beyond the root of the tongue, for the purpose explained."

83. For an *Improved Skate;* Alexander Barclay and Charles W. Boutgen, Newark, Essex county, New Jersey, April 17.

The patentees say,—"The nature of this invention consists in making the upper part of the skate of one or more pieces of iron, (instead of wood as heretofore,) of a skeleton form, raised at the heel, and provided with a spring to conform with the shape of the shank and sole and heel of the boot of the wearer, and attaching the same to the runner or lower part by dovetails, rivets, or other means, and further strengthening the attachment by projections on the lower surface of the upper part, and to dispense with the heel strap."

Claim.—"What we claim as our invention, is forming the upper iron part of the skate with segmental spaces at the forward and heel part, and an oblong opening near the centres and providing the same with a curved spring near the centre, for relieving the shank of the foot, and an inclined curved plate at the heel, and rings and rollers on either side, and securing the same to the runner by dovetailed or other formed projections on the upper edge of said runner, entering corresponding formed slots in the upper part, and further strengthening the attachment by projections on the lower surface of the upper part, on either side of the runner, through which, and the runner, bolts or rivets are inserted, in such a manner as to render the skate strong and durable, and to dispense with the usual heel strap, as set forth."

84. For an *Improvement in Machinery for Cleaning Hair;* John Radebaugh and John A. Matlock, Lancaster, Fairfield county, Ohio, April 17.

The patentees say,—"The nature of our invention, consists in combining a heating chamber, for preliminarily beating and opening the hair, by a series of rotating, elastic, vibrating rods, with another larger chamber, in which the operation is completed by the reacting vibration of a series of rotating tension cords."

Claim.—"What we claim as our invention, is the combination of a chamber, in which are placed a series of elastic arms, that are simultaneously made to vibrate as the disk from which they project is revolved, with another chamber, in which are placed a series of tension cords, that are made simultaneously to vibrate as the disks to which they are made fast are rotated; the arrangement of the two chambers, and the manner of operating upon the hair, being as described."

85. For an *Improved Machine for Making Carpenters' Squares;* Jeremiah Essex, Bennington, Bennington county, Vermont, April 17.

Claim.—"What I claim as my invention, is graduating squares and rules by means of an arrangement of chisels, which are movable either between or through bars, and are pressed upon the square by any known mechanical device or power, in the manner described.

"Also I claim what is termed stamping squares, or putting on the figures by means of dies arranged as the chisels are, and acting in the same manner."

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86. For an *Improvement in Apparatus for Making Soda Water;* Solomon Andrews and Job F. Halsey, Perth Amboy, Middlesex county, New Jersey, April 17.

Claim.—"What we claim as our invention, is the employment of a perforated ball or fountain in the manner set forth, for the purpose of making an effervescent beverage, or a drink saturated with carbonic acid gas, called soda water."

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87. For a *Railway Propeller;* Robert G. and Oliver P. Hatfield, City of New York, April 17.

The patentees say,—"The nature of our invention consists in hinging a certain number of legs to a wheel, which legs are carried around by the wheel, and governed by pins working in eccentric grooves, in such a manner as to cause the legs to strike the rail always in the rear of the axle, however steep the grade, and, by a pressure against the rail analogous to the action of a horse's leg, to force the carriage forward."

Claim.—"What we claim as our invention, is the combination of the revolving disk with the legs and straightening rods attached to it, and the eccentric slots which are constructed in fixed pieces of metal, and act upon the rods; the whole constructed and arranged as described, and constituting a propeller to be attached to a locomotive."

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88. For an *Improvement in Machinery for Separating Flour from Bran, &c.;* Edwin and James M. Clark, Lancaster, Lancaster county, Pennsylvania, April 17.

Claim.—"What we claim as new, is the combination of a runner and concave, and their adjustment one to the other, in the manner and for the purpose made known."

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89. For an *Improvement in Cultivator Teeth;* Joseph S. Honey, Hartford, Trumbull county, Ohio, April 17.

Claim.—"What I claim as my invention, is the self-sharpening four-pointed plate for a cultivator, with its iron bed, each of the four to be used successively, but when two have been used, the plate is to be turned over, bottom side up: that is, the rear made front, in order to use the other two.'

90. For an *Improvement in Machinery for Taking and Laying Paper from the Cutting Engine;* J. M. & L. Hollingsworth, assignees of John M. Hollingsworth, Milton, Norfolk county, Massachusetts, April 17.

Claim.—"What we claim as our invention, is the movable platform, table, or sheet receptacle, in combination with the system of endless tapes, and their supporting rollers, and applied to the paper making engine machinery, by which the sheets of paper are separated from the web thereof, and delivered to said system of tapes or endless bands or rollers, or any other equivalents therefor, or as applied to any contrivance or machine from which sheets of paper are to be received, and evenly packed or filed, as described."

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91. For an *Improvement in Trusses;* John W. Wood, Mount Sterling, Montgomery county, Kentucky, April 17.

The patentee says,—"The nature of my improvement consists principally in the adaptation of my supporter spring with fissures in the elliptic plates and springs, for the peculiar adaptation of the pads or blocks."

Claim.—"What I claim as new, is an improvement upon the abdominal supporter, spring, and elliptical pad, patented by me in 1835, by attaching the pads to the spring or supporter, so as to be moved in any position required by means of adjusting screws, fissures, and slides, the pad having a perpendicular motion allowed by the fissure in the block riders, as set forth.

"I also claim, in combination with the side springs, the straps to regulate the pressure, as described.

"I also claim the abdominal supporter boundary above the hernial pads, forming an opening between it and the lower boundary, and which is intended to sustain the abdominal viscera, and prevent its encroachment upon the internal abdominal ring. I also claim the mode of closing the internal ring in inguinal hernia, as set forth, by leaving the upper portion of the abdominal canal and internal ring free, as specified."

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92. For an *Improvement in Planing Machines;* Job Sheldon and John S. Barden, New Haven, Connecticut, April 17.

Claim.—"What we claim as our invention, is the method of groverning the set of cutters by the use of a cam in the central part of the cutter wheel, (whether above or below,) which will move the slides with diagonal grooves, so as to draw back the sets of cutters on one side of the cutter wheel, while those on the opposite side are cutting: that is, drawing back each set of cutters alternately, soon after it leaves the edge of the board or other article being planed, so as to avoid scratching the planed surface as it is coming out from under the cutter wheel, while the face of the cutter wheel is parallel to the face of the carriage. And the combination of the method of shifting the cam, so as to plane equally well when the carriage is running either way, with the method of elevating and depressing the cutter wheel, to conform to the thickness of the board or other material being planed."

93. For an *Improvement in Tan Vats;* Tarlton W. Brown, Howardsville, Albemarle county, Virginia, April 17.

Claim.—"What I claim as my invention, is the employment of the separate rising and falling bark chamber, for containing the bark, in combination with the main vat, containing the tan liquor, said movable bark chamber being made, arranged, and operated in the manner and for the purpose stated."

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94 For an *Improvement in Blast Generators;* Charles C. Lloyd, Philadelphia, Pennsylvania, April 17.

The patentee says,—"The nature of my improvement consists in providing drum-heads at the extremes of the machine, for the purpose of confining the water or other fluid within the same, thus superseding the necessity of a separate reservoir to contain the fluid; and in so arranging a valve or slip-joint at the end of the inner cylinder, which, while it prevents the compressed air from returning through the same, freely admits the water or other fluid to circulate from one extreme of the machine to the other."

Claim.—"What I claim as my invention, is the combination of the drum-heads, the valve or slip-joint, and the conduit pipe with the elbow, in the manner and for the purpose set forth."

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95. For an *Improvement in Piano Fortes;* Charles Hoist, New Orleans, Louisiana, April 17.

Claim.—"What I claim as my invention, is, 1st, the formation of the bottom of a piano of a metallic frame, combined with a wooden frame, or with blocks of wood, (as a substitute for the ordinary piano bottom composed of united boards,) for the purpose set forth.

"2d, I claim the formation of the body or sounding portion of a piano, independently of the outside casing, by the combination of the bottom with the requisite blocks and fillings, the sounding board, the rest plank, and the metallic frame, in the manner and for the purpose described."

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96. For an *Improvement in Mortising Machines;* Hezekiah S. Smith, Manchester, Hillsborough county, New Hampshire, April 17.

Claim.—"What I claim as my invention, is the above described combination of the two chisels and mechanism for operating them, so arranged, constructed, and operated, as not only to cut into the wood or stile in the manner necessary to form the mortise, but, by their combined action, to remove the chip or refuse wood therefrom, as specified."

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97. For an *Improvement in Driving Bobbins;* Arthur M. Eastman, Boston, Massachusetts, April 17.

Claim.—"What I claim as my improvment in the mode of operating bobbins, as invented by Francis M'Cully, Jr., and for which letters patent have been granted to him, and through him assigned to me, and by or through me in part to others, I still retaining a large proprietorship or interest in the same, is the combination of the flanch, the dead spindle, and rotary pedestal, in manner and for the purpose as specified."

98. For an *Improvement in Coffee Roasters;* Thomas R. Wood, Cincinnati, Ohio, April 17.

Claim.—"What I claim as my invention, is making the coffee toaster in a spherical form, provided with journals, in combination with a rim adapted to the form thereof, as described, whereby it can be adapted to the curved boiler holes of cooking stoves, ranges, furnaces, &c., and by which, also, it is adapted to the toasting of coffee more regularly than any other apparatus heretofore known.

"I also claim making the spherical toaster in two parts, substantially as described, in combination with the divided journals, as described, whereby the two parts can be separated and put together without the necessity of fastenings, as described."

99. For an *Improvement in the Water Ram;* Alpheus D. Smith, Meredith, Delaware county, New York, April 17.

The patentee says,—"The nature of my invention consists in the removal, in a great degree, of the back action, or the resistance to the backward or down motion of the impetus valve, which, in water rams as heretofore constructed, has hindered the play of the impetus valve; also in materially lessening the quantity of the waste water in the working action of the ram."

Claim.—"What I claim as my invention, is the peculiar combination and arrangement of the parts by which the impetus valve is made to work in a cylinder placed for that purpose within a chamber surrounding it, said cylinder being provided with openings in its sides, which may be enlarged or decreased, above the impetus valve, for the escape of the waste water, until its impetus becomes sufficient to act upon and close the valves; the whole constructed in the manner and for the purpose set forth."

100. For a *Curvilinear Blind Opener and Shutter;* Robert B. Rollf, Cincinnati, Ohio, April 17.

Claim.—"What I claim as my invention, is so connecting a window blind with a quadrant slide, made partly firm and unyielding, and curved to suit a quadrant casing, resting flush with the top of the window sill within the house, and partly of links jointed to suit, and attached to the blind, that, by means of a handle grooved to play in a slot in the quadrant casing, and screw-threaded where it passes through the slide, the blind can be thrown open and held at any angle, and forced back against the wall, the links of the slide being made to lie close to the blind, at the same time that they hold it firmly to the wall, by a slight retrograde movement of the handle, and screwing the handle and the slide fast to the casing, in the manner and for the purpose described."

101. For an *Improvement in Boxes for Railroad Cars;* Robert Levington, Monroe, Monroe county, Michigan, April 17.

The patentee says,—"The nature of my invention consists in the cup being so constructed as to keep the oil constantly around the journal, and at the same time show when the bearing box is worn out and needs replacing."

Claim.—"What I claim as my invention, is the combination of the tight oil cup with the axle, so constructed that said cup shall be constantly crowded up towards its cap as the composition bearing box is worn by the axle, thereby indicating the condition of said box by the space M becoming closed."

102. For an *Improvement in Cooking Stoves;* B. T. Roney, Newtown, Bucks county, Pennsylvania, April 17.

The patentee says,—"The nature of my invention consists, first, in forming a compound flue, for carrying the heat from the top and concentrating it at the bottom, and preventing its outward radiation; and secondly, the continuation of the air chamber up in front, so that it can be brought into use through a lattice door, for the purpose of roasting, and so constructed as to have a drop door between it and the ash pan, by which means the ashes may be taken out in front, as described; and lastly, the formation of the top frame around the holes of the boiler, by casting a recess in it, which communicates with the external air, by which the plate is preserved against the action of the intense heat below."

Claim.—"What I claim as new, is, 1st, forming a compound flue, as set forth, by conveying the smoke flue around the bottom and sides of the oven, and an air flue so arranged as to convey off the surplus heat from the top of the oven to the bottom of the stove, by which the heat is concentrated there in any proportion desired. I also claim extending the air chamber up the front, where it can be used for roasting, as described. I also claim, in combination with the flue z, the drop damper or door in the fire chamber, to open a communication with the ash pan for the purpose designated."

103. For an *Improvement in Mortising Machines;* John J. Weeks, Buckram, Queens county, New York, April 17.

The patentee says,—"The nature of my invention consists in cutting mortises in wood and other substances by means of an endless chain of cutters, (the cutters being formed in the outer edge of the chain,) which passes around two wheels or drums, one of them being of less thickness than the chain, and having its bearings in thin standards, so that the chain of cutters, or the cutting edges thereof, shall be of greater thickness than the said wheel or drum, together with its journals and standards, so that the said journals may cut a mortise, or slot, or groove, of greater depth than the depth of the chain and the semi-diameter of the wheel around which it passes."

Claim.—"What I claim as my invention, is the employment of an endless chain of cutters for cutting mortise grooves, &c., the cutters being formed on the outer edges of the links, as described, in combination with the wheel around which the chain passes, and which is mounted on their standards, so that the wheel and standards shall be of less thickness or width than the whole width of the cutting edges, as described, whereby a mortise groove or gain may be cut, by a continuous rotary motion, of greater depth than is due to the depth of the chain, and the semi-diameter of the wheel around which the chain passes, as described."

104. For an *Improvement in Machinery for Dressing Staves;* George Gilbert, New Haven, Connecticut, April 17.

Claim.—"What I claim as my invention, is so constructing the whole machine, that the rim or circle which carries the cutters for dressing the outer or convex side of the stave, may be firmly attached to, and sustained by, strong arms connected with a substantial wheel on the same arbor, axle, or shaft, as the other cutter wheel, so that the two cutter wheels may revolve in the same direction and in the same time; and so that the cylinder, within the arms that sustain this rim or circle, (having the back end closed,) may receive the staves as they fall, (after being fully dressed,) and prevent them from clogging the wheel; and in placing the other cutter wheel at such a distance from the open end of the cylinder as to allow convenient room to remove the staves at pleasure."

105. For an *Improvement in Abdominal Supporters;* Herbert R. Hubbard and George W. Hubbard, Middletown, Connecticut, April 17.

Claim.—"We claim the combination of the two ratches and spring clicks, or dogs, with the main springs and front pad, so arranged as to enable the wearer to regulate the pressure of the whole pad or either end of it at pleasure."

106. For a *Cut Nail from Muntz's Metal;* Samuel L. Crocker, Taunton, Bristol county, Massachusetts, April 17.

Claim.—"What I claim as my invention, is the new article of manufacture described, viz., a 'yellow metal' nail, made by cutting and heading it in a nail machine: meaning by the term yellow metal, a metal composed of copper and zinc, in the proportions in which they are usually combined in the manufacture of the well known 'Muntz's sheathing metal.'"

107. For an *Improvement in Carriage Brakes;* Amos B. McFarlan, Downingtown, Chester county, Pennsylvania, April 17.

Claim.—"What I claim as my invention, is the mode of turning the crank axle to actuate the rubbers, by means of the combination and arrangement of the connecting rod and eccentric wheel with the axle of the car to which this brake is applied, as set forth, by which the engineer may cause the brake to act gradually or instantaneously, and most effectually, at a moment's warning, for retarding or stopping the motion of the car."

108. For an *Improvement in Musical Instruments;* A. & A. J. Prescott, assignees of Joseph W. Prescott, Concord, Merrimack county, New Hampshire, April 17.

Claim.—"What I claim consists in the modulating dissembling chamber which encloses the valves, in combination with the swell chamber and reeds, all as specified; the said modulating chamber serving to properly disseminate the sound before it is allowed to enter the swell chamber."

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109. For an *Improvement in Daguerreotype Apparatus for Panoramic Views;* Isaac Van Bunschoten, (as joint inventor with, and assignee of, John G. Woodbridge and Wm. Mann,) City of New York, April 17.

Claim.—"I claim as new, the application of the lengthened slides, either to act in opposite directions on one camera box, or on a plurality of camera boxes, for the purpose of taking Daguerreotype representations in successive parts or sections, and effecting the junction or matching of successive sections, by combining with the foregoing parts the adjustable lip, for the purpose of shutting off any stray reflections from the parts already operated on while the next successive part is operated on, or of shutting off the stray reflections, at the commencement, from that part of the Daguerreotype plate that is to be operated on after the first portion, in the manner and for the purposes described."

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110. For an *Improvement in Grates for Coal Stoves;* Caleb Isbister, Allegheny City, Pennsylvania, April 17.

Claim.—"What I claim as my invention, is the manner of lifting the grate to its place, by means of the plate attached to the under side of the grate, combined with the piece on the back of the drawer, as described."

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111. For an *Improved Piston Ring, and Method of Deriving Motion therefrom in Rotary Engines;* John Tremper, Little Britain, Orange county, New York, April 17.

The patentees say,—"The nature of my invention consists in providing a hollow cylindrical ring, in the interior of which I place a movable ring, with cogs on its under surface, to mesh into a pinion or cog wheel on a shaft, to drive the said shaft when the ring is in motion. The said movable ring moves steam-tight in the cylindrical ring, and, by peculiar combinations and arrangements, operates its (or the exhaust) valves, and the steam or induction valves, in a novel manner."

Claim.—"What I claim as new, is the movable ring, with the cogs or teeth on its under surface or sides, and with the incline or wedge pistons on its upper surface, and moving in the inside of the cavity or chamber of the circular ring, as described, and for the purpose set forth."

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112. For an *Improved Tool for Attaching Tubes to Boilers;* Thos. Prosser, City of New York, April 17.

Claim.—"What I claim as my invention, is the combination of the guide ring, having mortises therein, with the segmental expanders, and conical or pyramidical mandril, constructed and operating as described.

"2d, I claim, as separate and component parts of the same, the double projections on the segments, having a hollow between them, to be placed opposite to the tube sheet while the tube is being expanded within it.

"3d, I claim the guide ring and the mortises in the same, together with the projections on the segments to fit into them. I do not, however, confine myself to any specific number of segments, form of projection on the segments to fit into the mortise guide ring, or position of the mortise guide ring itself, which may be placed inside the ring if required."

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113. For an *Improvement in Brick Presses;* Nathaniel Adams, Canterbury, Orange county, New York, April 17.

The patentee says,—"The nature of this invention consists in placing the brick, after being moulded in the ordinary or any convenient manner, on a horizontal plate, and forcing the same into a mould formed by plates firmly secured to the machine, and so arranged as to conform to the shape of the brick, and compressing the same in said mould by means of an eccentric roller and jointed plate, so combined as to form a cam motion somewhat similar to a toggle joint, with a sufficient force to smooth the surfaces of the brick, and render them suitable for the fronts of houses and other purposes where beauty of appearance is desired, and combining with this motion a reverse movement forming a duplex motion; the whole of the parts necessary to perform the operation being set in motion by a hand and foot lever, and arranged within a suitable frame provided with a pair of wheels at one end, to enable its being removed from place to place."

Claim.—"What I claim as my invention, is the mode of compressing the brick and withdrawing the same from the mould, by means of the concave space in the eccentric shaft, and oblong plate whose end is inserted in the same, forming a cam motion somewhat similar to a toggle joint, and tangential cogs or ears, connected together by a bolt or pin, and curved cogs, forming, with the movement mentioned, a duplex motion, in combination with the radial hand lever or bar and foot bar, by which the operator is enabled to exert the power of his hands and feet, as set forth; whether the parts above mentioned be combined with the pistons and other necessary parts, and constructed as those described, or any others substantially the same by which analogous results are produced."

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114. For an *Improvement in Galvanic Batteries;* Adolphus Olmstead, Easton, Northampton county, Pennsylvania, April 17.

Claim.—"What I claim as my invention, is constructing the battery with perforated rings or bars, through which are inserted tubular or solid pins or plates of zinc and copper, or other suitable metals, in the manner and for the purpose set forth, for producing voltaic electricity for medicinal and other purposes."

115. For an *Improvement in the Divisions between the Tubes of Flexible Boats;* Ebenezer T. Starr, City of New York, April 17.

Claim.—"What I claim as new, is making the interior divisions (which, to a certain extent, confine the webs or water-proof material forming the outer and inner surfaces of the boat) of some elastic substance, such as sheet india rubber, to allow of the expansion of the air contained in the compartments whenever the same shall occur from the exposure of the boat to a higher temperature than it was in at the time of its inflation."

116. For an *Improvement in Shoulder Braces;* Henry F. Briggs, Poughkeepsie, Dutchess county, New York, April 17.

The patentee says,—"The nature of my invention consists in having a strap, wholly or in part elastic, to pass horizontally across the back, near the lower angle of each scapula, which terminates at either end under the arms, by being connected with the shoulder straps by means of an elastic band. 2d, By having another elastic strap attached on either side to the lower edge of said back strap, anterior to the scapula, the free extremities of each having a loop by which it is attached to, and supports, the clothing in front."

Claim.—"What I claim as my invention, is the back strap attached to the shoulder straps, so as to form a continuous band to the posterior loops to which the dress of the wearer is suspended behind, and the connexion thereto of the posterior piece of the lateral pieces, and of the anterior pieces which terminate at the loops, the specific action of the whole being that of a suspender, combining a spinal and a shoulder brace, complete in all its parts, as set forth."

117. For an *Improvement in Planing Machines;* Enos G. Allen, Boston, Massachusetts, April 17.

Claim.—"What I claim as my invention, is, 1st, the combination of the non-elastic mouth piece with the upper feed rollers, it being attached to the frame in which they are mounted, and by which its position is so governed that it accommodates itself to the surface and thickness of the first shaving cut off the board, in the manner set forth.

"2d, I claim the combination of the series of stationary planes with the bed composed of alternate unyielding anti-friction rollers and flat cross-bars, the axis of the rollers being in the same vertical plane with the edges of the irons, so that their periphery may afford a constant support to one side of the board directly opposite to the point at which the iron is cutting the other, whereby the surface of the board, especially when it is thin, is rendered smoother, and its thickness more uniform, than if it were not thus firmly supported."

118. For an *Improvement in Machinery for Separating Flour from Bran;* Joseph Johnston, Wilmington, Delaware, April 17.

Claim.—"What I claim as my invention, is, 1st, the employment of the angular reflecting bars formed on a portion of the concave surface of the vibrating sifting cylinder, in combination with the radial wings on the surface of the upper portion of the close cylinder, when said cylinder is composed in part with the bristle or other brushes, said angular reflectors being thus arranged for the purpose of repeating the reflexion of the bran against the radial wings of the cylinder as often as the revolving cylinder throws it against the ribbed portion of the vibrating cylinder or concave, and thus detaching the flour from the bran before it comes in contact with the brushes to be driven through the wire cloth, as described.

"2d, I also claim the employment of the gravitating hammers or beaters, for the purpose of beating or detaching the flour from the meshes of the wire cloth, in combination with the pistons and cam wheel springs, and reticulated cylinder, whether arranged in the manner described, or in any other mode which is substantially the same; the vibrating or flexible cylinder being arranged on the springs, so as to yield to the stroke of the gravitating hammers, and thereby facilitating the discharge of the flour from the meshes of the wire cloth screen, as described."

119. For an *Arrangement of Flues in Marine Boilers;* R. F. Loper, Philadelphia, Pennsylvania, April 17.

The patentee says,—"The object of my invention is so to construct a boiler as to cause the products of combustion from the furnace or furnaces to divide into two parts, and again commingle alternately through a series of labyrinth flues, against the sides of which they are caused to impinge many times in the course of their passage through the boiler."

Claim.—"What I claim as new, is constructing the boiler in the manner described, by the employment of a series of central and side water tables, forming a flue, in which the gases are alternately divided and commingled in the manner and for the purpose set forth."

120. For an *Improvement in Water Rams;* Joshua L. Gatchel, Elkton, Cecil county, Maryland, April 17; (anté dated April 10, 1849.)

Claim.—"What I claim as my invention, is the conducting the water from the spring or fountain head to the ram, through a cluster of small tubes combined with the pipe that forms the body of the ram, in the manner and for the purpose set forth."

121. For an *Improvement in Spectacle Glasses;* David Hotchkiss and Benj. R. Norton, Syracuse, Onondaga county, New York, April 17.

The patentees say,—"The nature of our invention consists in so constructing glasses for spectacles, that the upper portion is adapted to viewing objects at a distance, and the lower portion to viewing objects near the eye."

Claim.—"What we claim as our invention, is constructing glasses for spectacles in such a manner that the upper portion of each glass is adapted to seeing distant objects, and the lower portion to seeing objects near the eye, the two portions being in one piece, as set forth."

122. For an *Improvement in Cutters for Tongueing and Grooving;* John Levy, City of New York, assignee of Hazard Knowles, Washington City, D. C., April 17.

Claim.—"What I claim as my invention, is making revolving cutters in the form of segments of circular rings, of less diameter than the cutter heads, and arranging and securing them in circular groves, which, at the parts where the cutting edges project, are tangential, or nearly so, to the circles described by the edges of the cutters, in such manner that slight inaccuracies in adjustment will make no perceptible difference in the operation of the cutters, and whereby the great loss of time and expenditure of labor now usually employed in adjusting revolving cutters for similar purposes are avoided, as set forth."

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123. For an *Improvement in Machinery for Breaking and Dressing Hemp;* Allen Eldred, Oppenheim, Fulton county, New York, April 24.

The patentee says,—"The nature of my invention consists in the employment of the two sets of revolving beaters, which act on the opposite sides of the hemp or flax to beat out the broken wood, when combined with the fluted breaking rollers, arranged so that the hemp or flax lies on the periphery or peripheries of one or more of the said rollers, which thus answer the double purpose of breakers and moving rests for the hemp whilst being beaten."

Claim.—"What I claim as my invention, is the arrangement of the rotating beaters, in combination with the arrangement of the two breaking rollers which reverse the hemp or flax, that both sides may be acted on in succession, and which constitute moving rests to sustain and move the hemp or flax while acted upon by the rotating beaters, as described."

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124. For an *Improvement which consists in Producing a Substitute for Wool from Jute;* William O'Conner, Jersey City, Hudson county, New Jersey, administrator of Henri Menean de Villeneuve, Paris, France, April 24; (anté dated June 23, 1840.)

Claim.—"What is claimed, is the producing of a material which may be substituted for animal wool, by taking that species of hemp called jute, or Calcutta hemp, and reducing it unto fine fibres, capable of being spun into yarn or thread of various degrees of fineness, by stamping, combing, and otherwise treating it in the manner set forth. It is not sought to claim either of the individual processes herein described as of said De Villeneuve's invention, but it is sought to claím him to have produced, by their combined operation, from a material hitherto of little value, a fibrous substance of great utility, and not hitherto known in the arts."

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125. For an *Improvement in Tanning by Electricity;* Epidaurus Irving, City of New York, April 24.

Claim.—"What I claim as new, is the application of a circulation of the electric fluid, supplied from any competent source of electricity, to accellerate the process of liming and cleaning hides and skins; and also the application of a like circulation of the electric fluid to accelerate the process of tanning hides of any description, with any proper tanning material or materials in solution, wholly irrespective of the description of hides or skins, and irrespective of the tanning substances employed, as described."

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126. For *Improvements in Machinery for Boring Bobbins;* Curtis E. Norris, Peacham, Caledonia county, Vermont, April 24.

Claim.—"What I claim as new, is, 1st, the combination and arrangement of the cam wheel, hinged vibratory boards, connecting arms, carriage and cord, weight, notched bar, trigger, and stop, for imparting to the spool to be bored a horizontal reciprocatory motion to and from the boring instrument, and for arresting the motion of the carriage at successive intervals, in the manner and for the purpose set forth."

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127. For an *Improvement in Fan Rocking Chairs;* Mary A. Woodward, Palmyra, Wayne county, New York, April 24.

Claim.—"What I claim as new, is combining with a rocking chair a curtain, suspended upon a frame affixed to the back of a rocking chair, and having a weight or weights attached to its lower edge, in the manner and for the purpose described."

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128. For a *Removable Fire Box for Locomotives;* John J. De Haven, Reading, Berks county, Pennsylvania, April 24.

Claim.—"What I claim as my invention, is attaching an independent fire box to the steam boiler, in such a manner as to render it easily removable, without displacing the boiler dome, machinery, or frame work, for the purpose of being repaired or replaced by another, whether the means of attachment be those herein described, or others capable of effecting the same object, and which have been used for analogous purposes.

"I do not claim making the dome to project from the end of the boiler, over the fire box, but when it does so project, I claim making it with a fixed and tight bottom sufficiently strong to resist the pressure of the steam, in order that it may be unnecessary to rivet it to the fire box, as has heretofore been the practice, and that one or more pipes, arranged so as to be easily detached, and of sufficient capacity to allow the free passage of the steam generated in the casing of the fire box, may be all the connexion that is necessary between the latter and the dome."

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129. For *Improved Forks for Holding Rope Belts upon Drum Wheels;* Charles Foster, Pompey, Onondaga county, New York, April 24.

Claim.—"What I claim as my invention, is the manner above described, of preventing the slipping of ropes upon wheels, viz., by attaching grippers or clamps to the periphery of the wheel, which are made to grasp and hold the rope by its own weight and the draught, the whole operating in the manner and for the purpose set forth."

130. For *Improvements in Cotton Gins;* Malcom McAulay, Thomasville, Thomas county, Georgia, April 24.

Claim.—"What I claim as my invention, is combination of series of ribs and lateral adjustable bearing supports with the ginning rollers, in the manner and for the purpose set forth."

131. For an *Improvement in Cotton Scrapers;* William C. Finney, Fayette county, Tennessee, April 24.

Claim.—"What I claim as my invention, is the peculiar connexion and arrangement of the slide, landside, and mould-board No. 1, as described, securing the proper position of the scraper, regulating the position of the stock, and preventing the alteration of its set by the wear from from friction, to which the unprotected helve is subject."

132. For an *Improvement in Saw Mills with Cylindrical Saws;* Gilbert Hatheway, Rochester, Plymouth county, Massachuseets, April 24.

The patentee says,—"The nature of my invention consists in the manner of constructing the cylinder or barrel of my saw, the mode of arranging and adjusting the carriage ways of my mill, and the guiding and fixing of a movable dog; and in the retaining of the form of a thin cylindrical saw while performing its work."

Claim.—"What I claim as my invention, is the forming of the carriage ways of a cylindrical saw mill, with arrangements for laterally inclining their position, with reference to the axis of the saw barrel, for the purpose of preventing the friction of timber against the outside of the barrel, as described.

"I also claim the movable dog, sliding on a support in the interior of a saw board, in a groove inclined in the axis thereof, and acting to keep the end of the piece of stuff which has been cut slightly bent as it advances, and out of contact, and consequently free from friction, against the interior surface of the barrel, whereby I am enabled to use a saw barrel of increasing thickness from the cutting towards the supporting end of said barrel, in the manner and for the purposes set forth.

"I also claim the combining of one or more inside, with four or more outside, cylindrical revolving guides, all capable of sliding longitudinally on their respective axes, so as to accommodate their positions to the gradual wearing away of the saw, and acting to prevent changes in its cylindrical form while undergoing rapid revolution."

133. For an *Improvement in Shoe Lasts;* John Whistler, Carlisle, Cumberland county, Pennsylvania, April 24.

The patentee says,—"The nature of my invention consists in two screws turned by a key; a piece of Russia iron extends from the top of the centre of the last to the toe, which is split and extends under the toe, or zinc at the toe."

Claim —"What I claim as my invention, is the employment of the extra screw No. 1, for expanding the uppers over the ball of the foot, in the manner and for the purpose described."

134. For an *Improvement in Corn Shellers;* Israel Kepler, Milton, Northumberland county, Pennsylvania, April 24.

Claim.—"What I claim as my invention, is the combination of the adjustable toothed shelling plates with the fixed bars or segments, to form a toothed concave, within which a spiked, fluted, or roughened cylinder revolves for the purpose of shelling corn, the whole arranged and operated as set forth."

135. For an *Improvement in the Machine for Polishing Stone;* George Fletcher, Sen., Greensburg, Decatur county, Indiana, April 24.

The patentee says,—"The nature of my invention consists in so constructing a revolving frame of radial arms, braces, and divisions, suited to the reception of guide boxes or carriages adapted to the rubbers for rubbing stone, that the boxes running on slides, and being charged with the rubber or other mass of stone, and the aforementioned frame being hung over a suitable bed, by revolving the frame, the guide boxes or carriages are not only made to travel in a circle, but to deviate, each one from the track of the preceding one, and from its own track consecutively."

Claim.—"What I claim as new, is the combination of a fixed bed and toothed wheel with a rotating frame, constructed and arranged as described, so that the pinions driving the rubber carriages radially therein shall cause them to pass over a different track, with regard to themselves and each other consecutively, the teeth on the fixed wheel not being a multiple of the teeth on any one of the pinions whether the pinions are of equal or unequal diameter, the one to the other."

136. For a *Filtering Apparatus for Steamboat Boilers;* Paul K. Hubbs, Holmesburg, Philadelphia county, Pennsylvania, April 24.

The patentee says,—"The nature of my invention consists in providing for steam boilers on board of steam vessels, a filtering apparatus, so placed as to receive the double action of pressure from the river below and a suction of a pump above the filter plate."

Claim.—"What I claim as my invention, is placing a boiler filter near or upon the bottom of a vessel, with a pump elevating the water from its upper surface, when the reservoir beneath the filter is connected with the outside water by means of two inclined apertures, with stops or valves for closing them, constructed as described, whereby the greatest amount of pressure may be exerted upon the filtering diaphragm, and it may be washed by a current produced by the motion of the boat, as described."

137. For an *Improvement in Obstetrical Supporters;* Abiathar Pollard, Ansable, and Simeon Minkler, Chazy, Clinton county, New York, April 24.

Claim.—"What we claim as our invention, is the combination and arrangement, as described, of the pads, straps, and handles, which hold up the above described instrument, called an obstetrical supporter, whether the said instrument be constructed in the manner described or in any other mode substantially the same, by which analogous results shall be produced, as set forth."

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138. For an *Improvement in Bedsteads;* Nathaniel Colver, Boston, Massachusetts, April 24.

Claim.—"What I claim as my invention, is the manner in which I construct the foundation or support of the mattrass or bed, for the purpose of making the bedstead portable, and easily set up or put together or taken apart, as circumstances may require: that is to say, I claim the combination of the two frames or halves of a box, each of said frames consisting of a side, two ends, and bottom or slats; the two sackings, each affixed to its frame at one side and two ends, and supported on springs or stuffing as occasion may require; the clamps and keys or wedges, for connecting the two frames, and the lacing holes, and lacing extending through the middle of the mattrass foundation; meaning in the above, to lay no claim to either of the elements of said combination when separated from the rest, but intending only to claim the whole as a combination, constituting a bedstead support for a mattrass or bed, and to which the parts are to be applied, substantially as specified."

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139. For an *Improvement in Machinery for Cutting Screws on Rails for Bedsteads;* William F. Converse and Jonathan Burdge, Cincinnati, Ohio, April 24.

Claim.—"What we claim as our invention, is the combination of the simultaneous adjuster and graduater with the headstocks, the semicircular female governors, and V or other formed bits or cutters, as described, through the medium of which a perfect simultaneous movement of the bits is produced in adjusting their relative distances, as regards the shoulders of the rail, and in cutting the screws, and also a simultaneous and equal adjustment of the headstocks."

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140. For an *Improvement in Machinery for Spinning Hemp, &c.;* William C. Hibbard, Boston, Massachusetts, April 24.

Claim.—"What I claim as my invention, is the permanent clearer and presser, in combination with the gill, operating in the manner described."

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141. For an *Improvement in Churns;* Samuel Huff, New Vienna, Clinton county, Ohio, April 24.

The patentee says,—"My invention consists in arranging a strainer in any kind of churn suitable for the purpose, in such a manner that the dasher will elevate the cream upon it, which will, of course, run through it, and down again in a series of small streams or jets, which exposes it, during its descent through the atmosphere, in the most favorable condition for that agent to act upon it; the butter, as soon as formed, being retained by the strainer, to be removed when accumulated in sufficient quantity to render that operation necessary."

Claim.—"What I claim as my invention, is the method of exposing the cream thoroughly to the action of the atmosphere, and separating the butter therefrom at the same time as soon as formed, by means of the air tubes and strainer, in combination with the dasher, arranged as set forth."

142. For an *Improvement in Frames for Mosquito Bars;* L'Aimable Prosper Jacques, Cincinnati, Ohio, April 24.

Claim.—"What I claim as new, is the arrangement of rods and springs, after the manner or principle substantially as represented, by which a tester frame or mosquito bar may be either erected or folded out of the way at pleasure."

143. For *Improvements in Cutting Out Cylinders for Bobbins, &c.;* Lewis Brown, Epsom, Merrimack, county, New Hampshire, April 24.

Claim.—"What I claim is the combination of one or more passages with the inner part of the cylinder, and discharging space or spaces between the ribs, in order to admit of the discharge of the chips or borings of the centre bit, as specified."

144. For an *Improvement in Planing Machines;* Charles H. Peck and Coleman Hicks, St. Louis, Missouri, April 24.

Claim.—"What we claim as our invention, is the feeding the boards or plank into the machine, and retaining them in a stationary position whilst they are operated upon by the series of planing, tongueing, and grooving cutters in the reciprocating frame, by means of the pressure rollers, which are so combined with the reciprocating frame, and with suitable retaining clicks and ratchet wheels, that the rollers will be rotated during the backward movement of the reciprocating frame, and retained in a stationary position during the forward movement of the same, as set forth."

145. For an *Improvement in Portable Beer Fountains;* David Gay, Bath, Lincoln county, Maine, April 24.

The patentee says,—"The nature of my invention consists in putting up beer and other fermented and gaseous liquors into portable fountains, for supplying venders of such liquors, and being drawn from a stop cock, retains the gas which is generated by the fermentation, and is necessary to keep the liquor good."

Claim.—"What I claim as my invention, is a portable fountain, in form and arrangement as described: that is to say, the combining therewith a refrigerator, and a gas receiver, to prevent explosions, and retain and preserve beer and other fermented and gaseous liquors in the manner and for the purposes set forth."

146. For an *Improved Method of Fastening Railroad Switches;* Francis G. Woodward, Worcester, Massachusetts, April 24.

Claim.—"What I claim as my invention, is fastening a railroad switch lever into its place by means of arcs, with slots or notches in them, attached to the lower part of the stand, into which slots a bolt drops, which bolt passes through an elongated hole in the lower part of the lever. I also claim locking the said bolt fast to the main lever, in the manner and for the purpose described."

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147. For an *Improvement in Boiling Sugar;* Knight Reed, New Haven, Connecticut, April 24.

Claim.—"What I claim as my invention, is the combination of the boiling pans, of this construction, with the pipes or tubes passing through the whole length of the series of boiling pans, and with the several dampers, to direct, vary, and change the direction of the heat, and with the clarifying pans, so set as to be heated by the same fire which heats the boiling pans, and yet so that the heat may be entirely shut from the clarifying pans, or either of them, at pleasure."

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148. For an *Improved Variable Power Capstan;* Edwin Allyn, assignee of Joseph E. Andrews, Boston, Massachusetts, April 24.

Claim.—"What I claim as my invention, is a capstan constructed as herein specified, so as to be susceptible of producing a quick and direct action to overcome a slight resistance, and a slow and more powerful action to overcome a great resistance, by merely turning the drum head round in the opposite directions while the barrel of the capstan always moves in the same direction; and the same being accomplished without any shipping or unshipping of gears, and by a system of ratchets, pawls, and gear wheels, pinions, &c., all arranged so as to turn with the capstan for the direct and quick action, but, for the slow and more powerful action, to turn the capstan barrel in the same direction by reversing the motion of the drum head: said parts being combined and operating as set forth."

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149. For an *Improvement in Diving Bells;* J. R. Worster, Baltimore, Maryland, April 24.

Claim.—"What I claim as my invention, is, 1st, the stationary mode of descent by slides attached to the canopy, corresponding in length to the depth of the water, and which slides pass through long upright grooves attached to the scows, the slides and canopy attached being forced down together by the rack and pinion, or other mechanical equivalents, the whole constructed as described.

"2d, The mode of supplying and using the light, by a lamp secured to the sides of the canopy, having a chimney passing out from the top, and a tube and stop cock from the inside, to admit a current of air of sufficient volume to sustain the lamp with two glasses, one of which throws the light inside, and the other out, the oil being kept in sufficient quantity in a holder on the inside, suspended under a vacuum and regulated by a stop-cock.

"3d, For the novel mode of communication through a tube reaching to the top of the slides, and with the mouth and stop-cocks attached."

150. For an *Improvement in Machinery for Sawing Wood;* David Bonner, assignee of Joseph M. Toy, Greenfield, Highland county, Ohio, April 24.

The patentee says,—"The nature of my invention, in the portable machine for sawing wood, consists in constructing a series of revolving toothed arms, and arranging them so that they will take the logs up from the platform, elevate them to a suitable height, and, in combination with a press beam, ratchet wheel, and pawls, hold them firmly until sawed in two or more pieces."

Claim.—"What I claim as new, is the combination of the turning arms with the press beam, ratchet wheel, reaching arm, and lever, for the purpose of raising, holding, and feeding the wood to be sawed, as set forth."

151. For an *Improvement in Machines for Making Grindstones;* Cotton Foss, Painsville, Lake county, Ohio, April 24.

The patentee says,—"The nature of my invention consists in combining with a revolving hollow cylinder of metal for cutting grindstones, by abrasion, out of flags of stone, an apparatus for supplying sand and water for the operation, in quantities proportional to the velocity with which the machine moves, which, of course, will be in exact proportion to the demand."

Claim.—"What I claim as new, is the combination of the apparatus for regulating the supply of sand and water with the boring cylinders."

152. For an *Improvement in Bellows;* William T. Barnes, Buffalo, New York, April 24.

Claim.—"What I claim, is a double acting vertical bellows, acting on the air by a centre movable board, forcing it alternately each way through valves, and receiving wind through it at the same time, as described, using any combination of movable boards, and arrangement of valves, which will produce the desired effect."

RE-ISSUE FOR APRIL, 1849.

1. For an *Improvement in Machinery for Making Felt Fabrics, &c.;* Hezekiah S. Miller, Cincinnati, Ohio; patented March 5, 1839; re-issued April 24.

The patentee says,—"The nature of my invention consists in converting animal or vegetable fibrous material into continuous webs, laps, or sheets, while using the one or the other, after they have been carded, picked, or blown, so as to wind into hat bodies and attain advantageously with fur the same end which has heretofore been effected in relation to wool, and to manufacture wadding from cotton, or other web from other fibrous vegetable material."

Claim.—"What I claim as my invention, is, 1st, the combination of the fan, oblong box or spout, and cylinder, for the purpose and in the manner described; and 2d, the combination of the two aprons, operating for the purposes and in the manner described; and also, these in combination with the combined fan, spout, and cylinder, as described."

DESIGNS FOR APRIL, 1849.

1. For a *Design for Carpets;* Peter Lawson, Lowell, Middlesex county, Massachusetts, April 3.

Claim.—"Having thus fully described my design for carpets and other similar fabrics, I desire to secure the same by letters patent, a full illustration being given in the drawing accompanying."

2. For a *Design for Carpets;* Peter Lawson, Lowell, Middlesex county, Massachusetts, April 3.

Claim.—"Having thus fully described my design, and illustrated the same by the accompanying drawing, I claim and desire to secure the same by letters patent."

3. For a *Design for Carpets;* Peter Lawson, Lowell, Middlesex county, Massachusetts, April 3.

Claim.—"What I desire to secure by letters patent is the above described design, for weaving into carpets and other similar fabrics, as fully set forth in the accompanying drawing."

4. For a *Design for Furniture Ornaments;* Cornelius & Co., assignees of Isaac F. Baker, Philadelphia, Pennsylvania, April 10.

Claim.—"What we claim as our invention, is the above described design called Major Heyward, as fully set forth in the drawing hereto annexed, and the use thereof as a furniture ornament, in whatever manner the same may be applied."

5. For a *Design for Furniture Ornaments;* Cornelius & Co., assignees of Isaac F. Baker, Philadelphia, Pennsylvania, April 10.

Claim.—"What we claim as our invention, is the above described design called Cora Munro, as fully set forth in the drawing hereto annexed, and thereof for ornamenting furniture, in whatever manner or in whatever combination the same may be applied for that purpose."

6. For a *Design for Stoves;* George E. Waring, Stamford, Connecticut, April 10.

Claim.—"What I claim as my invention, is the new and useful design for cooking stoves, which I call the Republic, as appears from the foregoing specification and the drawings attached thereto."

7. For a *Design for Stoves;* Chas. J. Woolson, Cleveland, Ohio, April 10.

Claim.—"What I claim as new, is the configuration and arrangement of said ornaments as designated and represented."

8. For a *Design for Stoves;* John and Alexander Morrison, assignees of Abram Haney, Troy, New York, April 17.

Claim.—"What I claim as my invention, is the combination and arrangement of ornamental figures and forms, represented in the annexed accompanying drawings, making an ornamental design for a coal stove."

9. For a *Design for Stoves;* Samuel H. Ransom, Albany, New York, April 24.

Claim.—"What I claim as my invention, is the combination and arrangement of ornamental forms and figures, represented in the accompanying drawings, forming an ornamental design for a cooking stove."

MECHANICS, PHYSICS, AND CHEMISTRY.

For the Journal of the Franklin Institute.

On the Dimensions of Steam Engine Chimnies. By Mr. H. F. Fairbairn.

The inquiry which appears in the June number of the Journal of the Franklin Institute, on the subject of the dimensions of steam engine chimnies, is one of the greater importance to Philadelphia, as it is certain that both beauty and profit can be made to arise out of the chimnies of the manufacturing establishments which may be founded in the city in future times. Philadelphia may be much beautified by the graceful forms of its steam engine chimnies, and a great annual saving in the consumption of fuel may be also made, in a city where fuel is destined to be at all times dear. Pleasure and profit may, therefore, be found in the construction of chimnies upon true mathematical rule.

Speaking comprehensively, the same rules may be given for the building of chimnies as for the proportions of columns; that one-half of the diameter should be diminished between the base and the capital; that the length of the shaft should be eight times the diameter of the base; and that the chimney should be circular in every part.

The same laws of resistance govern material and invisible substances; the cannon ball, the smoke from the cannon, and the sound of the cannon, all travel in the same direction, and with a velocity proportioned to the resistance of the air or the land. And as the sound of the cannon, so the sound of the human voice, and the sight of the human eye, must be governed by the same force of resistance to its progress over surfaces; and as the most gradual diminution of the diameter from the perpendicular line produces the least singularity, and therefore the least resistance to the passage of the eye over the external surfaces of a column, so the same form and dimensions will allow of the least resistance to the passage of smoke over the internal surfaces of chimnies, and that chimney is the best which will the most rapidly transmit the smoke to the external air.

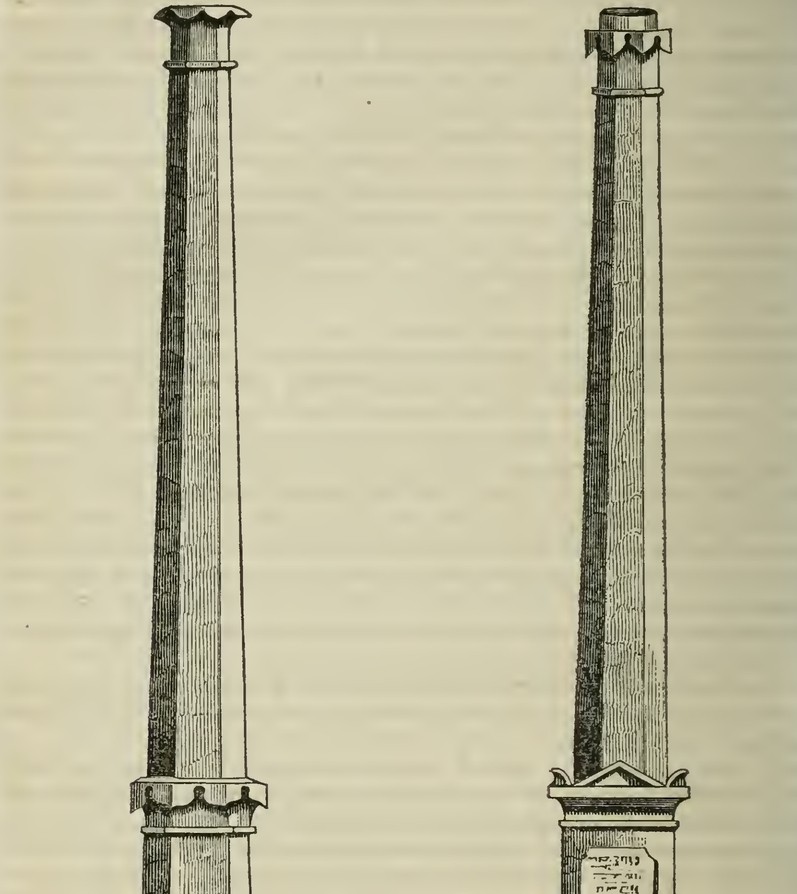
The finest steam engine chimney which yet has been erected in England is that of the West Middlesex Water Works Company, at Turnham Green, in the vicinity of London. This chimney is more beautiful as a column than the monument of London,—a pillar which was built by Sir Christopher Wren, in commemoration of the great fire in the reign of Charles II. It is crowned by a Corinthian cap of fine proportions with every other part of this noble specimen of a steam engine chimney, which is only deficient in the inferior color of the bricks of which it is built, and in its position, which is neither on elevated ground, nor in a part of the country where its beauties can be very fully displayed; but the proportions of this chimney are considered to be complete.

In the town of Manchester, in England, there are also many steam engine chimnies of great beauty of proportion, by means of which immense quantities of bituminous coals are burnt without any loss of heating power, these chimnies seldom exhibiting the appearance of sensible smoke. The cotton manufacturers of Manchester vie with one another in the height and proportions of the steam engine chimnies, and some failures, in the foolish extreme of building the highest and most ambitious, but, at the same time, too perpendicular chimnies, have brought those now erected to be generally perfectly columnar in form, and not more ornamental to the town than economical in the consumption of coals, and very greatly beneficial to the health of Manchester, by the cessation of the black cloud of smoke which formerly vulgarized that great English manufacturing town. However large the outlay of money for the chimney, this is now seldom considered by the manufacturer, for the saving of coals, and the efficiency of the steam engine, repay almost any expense so incurred; and it has been long since discovered that Manchester may be improved by the beauty of the steam engine chimnies, and that the pocket of the manufacturer may be improved at the same time.

Two specimens of design in this description of architecture, taken from a work on Manchester, which was published some years since, will be found on the following page.

In these chimnies the internal diameter is uniform throughout the entire length of the shaft, and this is all that can usually be expected to be obtained without an increased expense, which will seldom be undergone by manufacturers for the purpose of carrying out the mechanical and the chemical principles which apply to any particular trade. But on true scientific principles, the internal diameter should certainly be diminished gradually as the chimney ascends, for it is clear that, as the smoke and gas pass further through the brick work, which has been cooled down in the proportion in which it is removed further from the furnace wall, (the original source of the heat,) the surface of resistance ought to be decreased and the chimney made narrower. As the heat of the smoke decreases its condensation increases, and its expansion and ascending power diminished in the ratio in which the heat is lost. A gradual compression of the internal diameter would be the perfect mode of constructing chimnies on all the chemical and mechanical rules which apply to the passage of heated air.

The chimnies here shown are externally of an octagonal form, this being thought, by the author of the work on Manchester, to be capable of a finer ornamental effect in the blending of light and shade. "The association of light and shade is more striking in the octagonal than in the circular form of chimnies. In the former, the three great degrees of light and shade are produced, namely, light, middle tint, and shadow. In the latter, the extremes of light and shade, pass insensibly into each other, and produce but a feeble effect when compared to the finer and the clearer tints of the octagonal form." There is much good taste in these observations, and the effect of light and shade is still more worthy of attention in the production of the ornamental of Philadelphia than of Manchester, as the climate is



not so clear in England, and the effect of light and shadow very much less marked and imposing than in the United States. The sky in Pennsylvania is of the dark blue color of the parallel latitudes on the Mediterranean Sea, and as the effect of the minarets and other columnar structures of Venice and Constantinople is derived from finely graduated proportions, when seen against the finest of skies, and as there is no smoke perceptible from the chimnies of the greatest elevation in the manufacturing districts of England, (for the combustion is rendered perfect by the powerful draft of these chimnies,) so in Philadelphia there will be, still more than in England, a removal of all traces of black smoke where anthracite coal is in use, and consequently a removal of that which mars the purity of the architectural effect of a column seen against the usually clear blue sky.

An octagonal chimney is, therefore, recommended for its production of strong tints of light and shade, and for its variety as amongst other chimnies of the circular or the square form, and because it is not more expensive of construction than a chimney circular throughout.

Respecting the ornamental work of a chimney, its shewing the cap of the Corinthian or of any other order of columnar architecture, it is requisite that keeping be studied with reference to the general architectural character of the city in which the building stands. The city of Philadelphia is plain—was laid out by a man eminently mathematical in his mind; utility was in the view of the founder of the city of right angles, but then utility includes proportion, and in proportion all solid beauty finally resides. The Corinthian column may be thought to be not in true keeping with the general character of the architecture of Philadelphia, nor are there wanting those who think that all ornaments to columns have been the production of ages when taste has been on the decline; that neither the acanthus flower nor the horn of the ram are in their natural places when growing out of the tops of columns of stone, but that the Doric columns of the Parthenon remain the most impressive, although the plainest, of all the structures of the columnar kind. The chimnies given from the work on Manchester are of a description suitable to the general architecture of Philadelphia, plain but not absolutely without ornament, with pedestals and tablets of marble or other material, recording the history of the erection of the place, and becoming a *monumentum in perennio* to the manufacturer and citizen of Philadelphia, who shall have built the finest architectural column and saved the most anthracite coal at the same time.

There is some difficulty to be expected in the establishment of a perfectly scientific system of chimney building in the city of Philadelphia, as there are erroneous models already in existence, the errors being very grevious of those which are the highest, and the best shown with regard to their dimensions, internal and external, and which are the most inquired after by those who are erecting iron works and other manufactories in the interior of the State.

The chimney of Messrs. Powers & Weightman, manufacturing chemists, in Spring Garden, Philadelphia, is the highest in the United States. This chimney is square and its internal diameter increases towards the top; two errors which have been disseminated from this chimney extensively through the State, almost all the iron works which have been erected during the last ten years having chimnies of similar form and internal dimensions as the Philadelphia chimney of the chemists, which appears to be the model chimney of the State. It is argued that the plan of this chimney was brought from Europe as the best of all chimnies; that it has answered the purpose well; the nuisances of the former chemical works have disappeared from the air of Philadelphia, and the eminent firm of manufacturing chemists are sufficiently satisfied with the effect which has been produced.

But against this, it is to be remembered that the chimney is 126 feet in height; that the vast expense here incurred was for a purpose, to accomplish which capital was not regarded so much as success, and that although air and smoke sufficient for a comparatively limited purpose can be passed through a tube of excessive length, this is no reason why the same currents of air should not be passed through better formed chimnies, of considerably less height, costing considerably less money, and looking very much more beautiful to the eye. The chimney of the Spring Garden chemists will "do very well," but that is no reason why other manufacturers ought not to go further into its merits before adopting, in other situations, a model which has no other merit than that it is the highest and most striking to the view of all the chimnies which yet have been erected in the United States.

It is also said that the same manufacturing firm have proved their case as in favor of the square chimney, by the erection of a circular chimney at their other works, at the Falls of Schuylkill, and that "no good has been obtained" by the erection of this latter chimney in a circular form. Here let it be observed that the chimney at the Falls of Schuylkill is circular undoubtedly, but it has been curtailed of its fair proportions, is deficient by full one-sixth part of the true columnar proportions, and it is not singular that no better effect should be produced in the draft of air through a stunted circle than through a square of redundant length. The chimney at the Falls of Schuylkill has no pretensions to the proportions of a model, and until a circular chimney, of the same height with a square chimney, shall be shown to have carried away a smaller volume of smoke, and therefore to have overthrown all the established principles of chemistry and mechanics, it is not sufficient that there can be a circular chimney, otherwise defective in its construction, which shall be no better than a square chimney, which has been built at double the expense.

The chimnies of steam engines scattered through Pennsylvania are almost all erroneous in formation, and particularly at the various iron furnaces of the State. There are chimnies built on the principle of the chimney of the chemical manufactory of Spring Garden, which, in consequence, waste an expense of thousands of dollars per annum for coal; one of these chimnies on the Schuylkill river, for a steam engine of 90 horse power, costing $7000 per year, at the rate of five tons of coal per day at $4 per ton; and yet the boilers of this engine are fitted with all the apparatus for conveying the hot air from the tunnel head of the furnace; nor would there be any coals whatever required were the chimney not built widening towards the top, and capable of carrying off only about one-third part of the proper column of air, which the furnace could easily supply.

The subject of the form of steam engine chimnies is one of leading importance to the iron manufacture of the State, and though iron furnaces are not situated in cities, and the ornamental is not the first of considerations, yet is there very great loss of capital incurred by the erection of chimnies which, in the words of "H." are "square masses of brickwork of small elevation," &c.

To be a column, eight diameters of the base is the height of the shaft, and with a diminution of one-half of the diameter at the top, are, therefore, the leading proportions to be preserved in the view of the builder of a steam engine chimney; the external ornament of circle or octagon, of capital or none, and other such considerations, being of less importance, and depending upon circumstances for which there is no general rule."

For the Journal of the Franklin Institute.

The American Steam Navy.

In the October number of the Journal, I alluded to the steam vessels belonging to our Navy, and which at that time, including *all classes*, numbered seven. Since then, the "Edith" has been lost in the Pacific, so that we are now reduced to six, and five of that number are very indifferent vessels, leaving the "Mississippi" alone to sustain the credit of the country; and, so far as one vessel can, she will nobly do it.

There are now building four steamers, the "Powhattan," "Susquehanna," "Saranac," and "San Jacinto." The first at Norfolk, the second at Philadelphia, the third at Portsmouth, N. H., and the last at New York. The first two are 250 feet long, and 45 feet beam, and the last two are 196 feet long, and 37 feet beam. The first two have side wheels, and two inclined engines, each with cylinders 70 inches diameter, and 10 feet stroke; the third has side wheels and 2 inclined engines, with 60-inch cylinders, 9 feet stroke, and the fourth has a propeller and two inclined engines, working across the ship, with cylinders 60 inches in diameter, 4 feet 2 inches stroke.

When it is taken into consideration that, in war steamers, every foot of room possesses a double value from the large number of men that have to be accommodated, we may well inquire why it is that *all* of these vessels have engines that take up so much space in the ship, to the discomfort of every one on board. The space between bulkheads, on the "Susquehanna," is 89 feet of the widest part of the vessel. Without disturbing the arrangements of the boilers, engines of equal efficiency, and less weight and cost, could have been put in, and the whole space occupied reduced to 60 feet. In fact, no other form of marine engine at present known, could be *spread over as much space* as the inclined engine adopted in these vessels. To be sure, by adopting some other form, we could not have used several so called valuable *American Patents*, but what was lost by the inventors would have been doubly gained to the country.

The Board of Engineers, who determined the form of engines for these vessels, were of *one opinion*, that nothing but inclined engines should be used. Their *reasons* have never been made public, and while all the engineers of this country and Europe are in the dark as to the advantages of this form of engine, the Navy Department very unfairly keeps all the information to itself.

The use of the inclined engine has heretofore compelled the decking over of the lower part of the engine, to obtain room for stores, &c., and in some cases, the firemen, who are *roasted* while on duty, have been almost *boiled* when in their rooms. The "Missouri" was burnt by having a store room over the engine.

The forms of engine most used in the English Navy at present, are vertical direct action and the oscillating, and they have been well proved as worthy of confidence. But the fact of their being well tested there appears to have been an objection to their use here. We must have *American engines;* our flags are entirely different, why should not our engines be so? And we have the satisfaction of knowing that our engines are independent and *original.*

In examining a list of the builders of machinery for the English Navy, the names of Maudsly, Napier, Seaward, Fawcett, Boulton & Watt, Rennie, Fairbairn, Penn, and other celebrated builders, appear, all of whom *design* the engines they build, the plans being first approved by the Government, and a superintending engineer being stationed at the works. By this means, the talents of all the builders in the country are made available, and the competition between them stimulates all to active exertion, and the cost of Government engines does not exceed that for private service; while here, the system that prevails is opposed to improvement, and while it enhances the cost of the engines at least one-third, is productive of no good to any one, not even to the contractors, who would much prefer a different system.

It is to be hoped that the present Secretary of the Navy, who is not committed to the errors of the past, will take a proper view of the matter, and if so, any steamers that may be built during his term will be done in one-half the time, and at two-thirds or three-fourths the present cost, while their machinery will take less room, and give more comfort to all on board.

X.

For the Journal of the Franklin Institute.

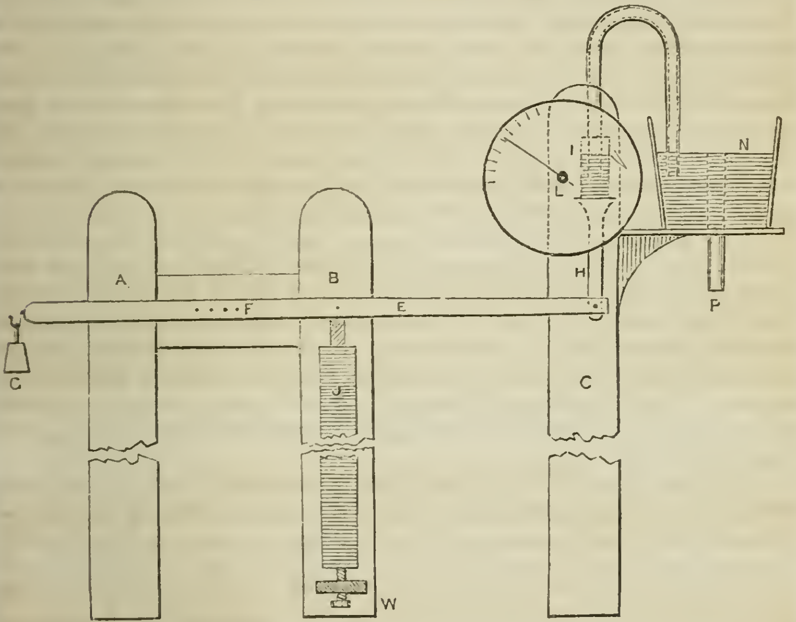
Description of a Hygrometer, for Regulating the Moisture of the Air in Closed Apartments. *By* John M. Batchelder.

In a letter of Franklin, addressed to Edward Nairne, of London, a plan for a hygrometer is mentioned, which was afterwards made by Mr. Nairne, and is described in Vol. iv., page 449, of Sparks' edition of Franklin's Works.

In this instrument the motive power is derived from a slip of wood, one end of which is fixed, and the other end attached to the short arm of a bent lever, which is moved by the expansion and contraction of the wood, the extent of the motion being shown upon a graduated arc at the extremity of the lever.

Having found that an hygrometer resembling this, which I have used for several years past, is very readily affected by changes of moisture, I have made one upon a similar plan, and attached to it an apparatus which will produce any required degree of moisture in the apartment in which it is placed. An instrument of this kind will not indicate the dew-point with accuracy, neither can two instruments be made to give precisely the same expansion or contraction when exposed to the action of the same degree of moisture; it is, therefore, of no value for observations that are to be recorded and compared with each other, but each instrument, when used in conservatories, or in any place where the temperature is nearly uniform, will, if the air becomes too dry, restore it to that degree of moisture that has been previously determined upon as the most desirable.

In the annexed figure, A, B, and C, represent standards of wood which support the apparatus; E is a lever having its fulcrum at F. Upon the top of the perpendicular rod H, which rests upon the horizontal lever, a light open-mouthed vial or cup, I, is placed, having an orifice and lip, S, at its side, near the top; this contains about one gill of water, its weight and the weight of the long arm of the lever being balanced by the counterpoise G. J is a slip of bass wood, (Tilia Americana,) four feet in length, two inches in breadth, and one-eighth of an inch thick, the grain running in the direction of its breadth, or horizontally. This wood should be perfectly sound, of straight grain, but not of very close texture, its exterior being made rough by the use of coarse glass paper, in order to expose a larger surface to the air. At the bottom of the standard B, is a nut and adjusting screw, W, to which the slip of bass wood is attached; a plate of brass is screwed to the top of the wood, and is fastened by a pin to the lever E; from this lever a silk thread is carried around the pulley L, in a spiral groove; the axis of this pulley passes through a dial plate and carries an index. At N is a vessel of water, having a proper supply pipe leading to it, the water being retained at a uniform level by the waste-pipe P, and connected with the water in the small vessel by a syphon. The respective length of the legs of the syphon is immaterial, as the flow of the water depends upon the relative level of the surface of the water in the reservoir,



and that in the cup; both legs being immersed, the syphon remains constantly filled with water.

To put the instrument in operation, let the apartment be kept at its mean temperature, and at the degree of moisture required, both of the vessels and the syphon being filled with water. After the instrument has been exposed to this atmosphere a short time, turn the screw at W until the orifice in the vessel I is level with the top of the waste-pipe P; then turn the pulley L, and set the index at zero. The instrument being thus adjusted, if the air becomes more dry the slip of wood contracts, the small cup descends, and water flows into it from the stationary reservoir; the water then escapes from the orifice in the side of the cup, falls into a funnel, and thence into a pipe, which, when the instrument is used in green-houses, conveys the water to evaporating pans placed upon the flues, or to a horizontal pipe, having openings at its upper surface at suitable intervals, from which the water falls at any point desired. As the water thus discharged evaporates, the surrounding air is moistened, the wood is expanded, and when it attains its original length, the orifice in the cup is again raised to the level of the surface of the water in the reservoir, and the flow of the water ceases. If, from any cause, the air should become too moist, the only effect produced is, that the cup continues to rise, and a small quantity of water flows back to the large reservoir.

If, by accident, the air should become very dry, the further contraction of the wood causes a larger quantity of water to issue from the cup than is due to this change in the hygrometric state of the air, the discharge being *accelerated* as the difference of level between the two surfaces increases; thus the return of the air towards its normal condition is the most rapid at the time when it is of the most importance that the moisture should be restored. The same degree of moisture may be made to discharge a greater or less quantity of water, by moving the fulcrum of the horizontal lever to the right or to the left.

The opening and closing of valves and stop-cocks is attended with much friction, but in this instrument, it will be observed that the water flows through the syphon with a very small amount of friction, and that little power is required to depress the cup. This plan may, therefore, be used to advantage in many instruments in which the motive power is small, the weight of the water discharged being applied to produce more extended or more forcible movements.

Boston, November, 1849.

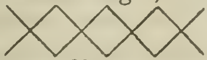
For the Journal of the Franklin Institute.

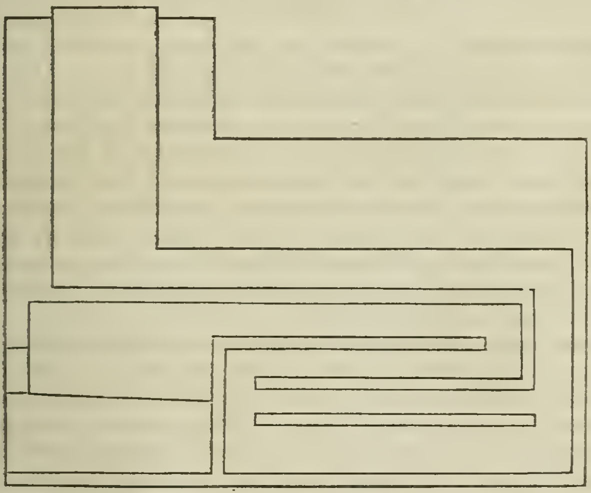
Particulars of the Steamship "Ohio."

This fine mail steamer, recently finished for the line between New York and New Orleans, via Charleston and Havana, has just left on her third trip, and the following particulars concerning her may be of interest to the readers of the Journal:

Length of keel, 240 feet; length on spar deck, 265 feet; depth of hold from spar deck, 33 feet; do. do. from main deck, 25 feet; breadth of beam, 46 feet; by government measurement, 2300 tons. She is fitted with two side lever marine engines, having cylinders of 90 inches diameter. Length of stroke, 8 feet; diameter of water wheels, 36 feet; width of wheel, 10 feet.

The general arrangement of the engines does not vary materially from those of the "Canada" and "Europa," but some of the details are different. They have the long D slide valve, the "Ohio" has (double) balance valves, and while the steam valves are worked by one eccentric, so adjusted as to cut off the steam at any part of the stroke, the exhaust valves are worked by a separate eccentric, which may be set to give any desired lead. The valves being nearly balanced, may be worked with ease by hand.

The engines are a creditable piece of work, both as to design and finish, and appear to have proper strength for the duty they will have to perform. The boilers are four in number, two forward and two abaft the engines, each one being 15 feet wide, 21 feet 6 inches long, and 14 feet 2 inches high, having 4 furnaces, with grates 8 feet long. Using anthracite coal, with fan blast, 15 lbs. of steam can easily be maintained. The flues of these boilers are arranged somewhat different from any heretofore built, and are the only ones of the kind. After passing to the bottom, as is usual in drop flue boilers, they rise and pass to the front again, where each pair of boilers unite in one chimney. By placing the boilers before and abaft the engines, the firemen are at all times in sight of the engineer, the weight is more evenly distributed, and any liability to strain the ship from that cause avoided. The "Ohio" has a diagonal framing of 3-inch round iron extending her whole length, between the centre kelson and main deck beam thus  which insures greater strength, and is not usually done. She can accommodate 500 passengers of various classes, and recently left New York with that number. She connects at Havana with the "Falcon," for Chagres, and a good portion of her passengers leave at that port.



The owners of the "Ohio" have another vessel, the "Georgia," of equal power but different model, nearly done, and as these vessels will be the same in all other respects, a very good comparison can be made between them. On the completion of the "Georgia," I will announce the result.

The engines of the "Ohio" were built by T. F. Secor & Co., New York; the hull by Bishop & Simonson; the whole being under the supervision of Joseph N. Scott, Esq., Chief Engineer of the line. B.

For the Journal of the Franklin Institute.

On the Internal Form of Iron Furnaces. *By* Henry Fairbairn.

I propose a change in the internal form of furnaces, as now generally constructed in the anthracite iron manufacture.

The furnaces are usually cylinders, and when not perfectly cylindrical, the deviation from the perpendicular line from the boshes upwards, does not commence until about 10 feet from the tunnel head. Thus from the boshes for 14 or 15 feet upwards, there is no arch, and the wall of the furnace is a perpendicular line.

Here is the error which it is proposed to remedy, for an error of the first magnitude it is to build iron furnaces which are not correct in every part of the interior arch.

In a circle, pressure and resistance are equalized over every part, whilst in proportion to the deviation from the circle towards a perpendicular line, the pressure is towards the lowest point, because the force of gravity is increased in a corresponding degree. Therefore it is that the coals, the ore, and the limestone fall with a three fold degree of pressure against the walls of a furnace which has only the usual deviation of 1 foot in 14 from the boshes upwards, than though the curve were 4 feet or 4½, or one-third of the usual diameter of about 13 or 14 feet, or a true circle throughout. And this unequal pressure of the materials is the principal cause of the rapid destruction, and of the inferior yield of the anthracite iron furnaces of the present form. When the materials, particularly the large lumps of anthracite coal, roll down, and are pressed and wedged against the walls of the furnace, the blast cannot make entrance equally through masses of such materials, and consequently makes its way upwards at the next opening, which is at the centre of the furnace, as containing less of the resisting masses, the gravity of which has carried them down against the walls. The consequence of this is, that the materials are at all times pressed and packed so densely against the walls of the furnace, that one-third only of the blast penetrates that large part of all the materials contained in the furnace; that this may be estimated as so much additional cold wall filling up the furnace, and that the weight of the blast is driven up through the centre and lost at the tunnel head.

It is therefore proposed that an iron furnace shall be no longer a cylinder, but an arch, conical and curved in every part. By this form the internal walls will not be perpendicular from the flues and the boshes, but will be arched, and the diameter 3½ feet increased at the widest part—supposing the distance to be 14 feet, which is the usual form. The dimensions of a perfectly formed iron furnace would be one-third of the height for the extreme width, and one-eighth of the height for the narrowest part, at the tunnel head; and if the furnace be 42 feet in height, it would be 14 feet at the boshes, and from this widest point, curving regularly to a width of $5\frac{1}{4}$ feet at the tunnel head. In a furnace of this form the materials would descend regularly and with an exact pressure upon every part; the blast would meet with no unequal resistance over any part of the materials; the combustion would be spread over all the lower parts of the masses of anthracite coal, which would not then be lodged and wedged against the walls, and that fuel would be employed in smelting iron, which now is lost and wasted in the form of flame at the tunnel head.

Full one-third more iron would be made in the same furnace which should be circular in every part than in one only cylindrical—110 tons per week being produced in the place of 80 tons.

The wear and tear of the furnace would be also diminished two-thirds, and an anthracite furnace would continue in blast three or four, or more, years, without repairs, for the blast would penetrate all parts of the furnace equally; the lower parts would not be mechanically damaged as now by the pressure of heavy masses of materials concentrated at the lowest point, nor would the upper parts and the flues be burned out in the same excessive degree by the internal stream of flame driven against them, and lost at the tunnel head.

To make one-third more iron, and the furnace to last two or three times longer without repairs, are therefore the advantages to be gained by the adoption of the arched form of the furnace, as here proposed.

There is a deficiency of information on this subject of the internal form of furnaces—the work of Professor Walter R. Johnson, on smelting iron with anthracite coal, being the only one in which the importance of the internal form of the furnace is preserved in view. Nor in that work is the best form of an iron furnace attempted to be given—the information being principally statistical—the dimensions, proportions, and successful or unsuccessful results in the production of iron being described of many of the furnaces existing up to about ten years since; but there is no definite deduction to be discovered in the work of Professor Johnson, nor any rule for the best internal form. A comparison, however, of the various descriptions and diagrams of Professor Johnson will certainly furnish evidence of the success of the furnaces which approached to the circular form; the Stanhope furnaces in New Jersey being a proof of the advantages of such an interior, and the Shamokin furnace of the contrary failure of a furnace of a pyramidally formed interior. Practice, therefore, so far as there has been any, is in favor of the arch, equally as are all the doctrines of pressure and resistance; and an iron furnace is one continued scene of pressure and resistance, both of solids and fluids, of the coals, iron ore and limestone, and of the air and the course and direction of the blast.

Translated for the Journal of the Franklin Institute.

Meteorological Phenomena. Formation of Clouds.

Captain Rozet, employed during the summer and autumn of 1848 in geodetic triangulations in the central portion of the Pyrenees, and, in consequence, often placed at great heights, had before him, to the north of the chain which separates France from Spain, an immense perspective of the atmosphere which covers the French valleys stretching from the foot of the Pyrenees.

In calm weather, towards sunset, the atmospheric vapor formed a true sea of fog, the upper limit of which was very perceptible, well defined, and perfectly horizontal, that is, spherical, having a height above the sea of about 1300 metres. (4270 feet.) This foggy stratum, which was about 900 metres (2955 feet) thick, was, so to speak, the reservoir of moist air, which, by movements originating in the mass itself, and without external influence, gave rise to the different kinds of clouds which the observer saw forming, at the expense of this sea of vapor.

And in the first place, a portion of this foggy atmosphere rose, and losing its transparency became visible, but always passing into the state of *stratus*, that is, clouds in horizontal layers, and of but slight thickness. This first formation is evidently in accordance with the laws of movement of a warmer layer which rises from the bosom of an immense fluid mass. These original *stratus*, by an internal agitation easily conceived, afterwards transformed themselves into *cumulus*, that is, into clouds with a horizontal base, rounded and mammelated on their upper surface. These cumulus formed a stratum of from 400 to 500 metres (1300 to 1642 feet) in thickness, the highest part of which reached an elevation of 1800 metres. (5910 feet.)

These cumuli, disturbed in different ways, become *nimbus*, at heights which never exceed 3200 metres. (10,507 feet.) These nimbus, rainy and stormy clouds, have an elevation which is very variable. The internal constitution of this kind of clouds must be very complicated, and at certain points partial storms burst out, in which the rest of the cloud does not participate.

A remarkable peculiarity, and one which may throw light upon the theory of *heat lightning*, to which M. Arago has paid attention, is that, according to M. Rozet, "when these storm clouds touch the earth, electric discharges frequently take place without any noise, and thus form true *heat lightning* at a small distance from the observer."

Comptes Rendus de l'Academie des Sciences de Paris, March 5, 1849.

Translated for the Journal of the Franklin Institute.

Fusion and Volatilization of Refractory Bodies. Note of Some Experiments made with the Triple Combination of the Voltaic Pile, the Sun, and the Blowpipe. By M. DESPRETZ.

M. Despretz, in these experiments, used a battery equivalent to 185 pairs of Bunsen's combination of ordinary dimensions; the height of the zinc about 5¼ inches.

An annular lens of about 3 feet diameter.

An oxy-hydrogen blowpipe. The following were the results:

Hard and compact magnesia, which, under the action of the pile alone, assumed a pasty state, was immediately volatilized in white smoke by the combination of the pile and lens.

A needle-shaped piece of anthracite, of about ·04 in. in diameter and 1¼ in. in length, was bent by the action of the pile and lens. Another piece, submitted to the simultaneous action of the pile, lens, and blowpipe, appeared to fuse. Two persons present, besides the Professor, thought they saw the anthracite fall in drops.

In another similar experiment, he collected in a platinum capsule placed under the piece of anthracite, several small black globules visible to the naked eye. Ibid, June 18, 1849.

In some subsequent experiments, reported at the session of the 16th of July, operating with a Bunsen battery of 496 pairs, arranged in four parallel series, and about equivalent to 124 pairs of four times the size, and in the vacuum of the air pump, M. Despretz succeeded in volatilizing charcoal from sugar, "with much the same appearance as when a fragment of iodine is thrown upon a body sufficiently hot." The charcoal was deposited on the sides of the containing vessel, in a dry, black, crystalline powder. Every precaution was taken to avoid the presence of organic matter in the charcoal. Alumina was first melted, and then volatilized.

Translated for the Journal of the Franklin Institute.

On the Cooling of Masses of Air which Rise in the Atmosphere. Extract from a letter from CAPTAIN ROZET *to* M. BABINET, *dated June* 11, 1849.

You asked me to make experiments upon the cold produced by the dilatation of a current of air which rises along a regular slope under the action of a steady wind. It is not as easy as it might be thought, to find all circumstances favorable for such experiments; nevertheless, I have met them thus twice already in the chain of Corbieres, in the southern part of the department of the Aude, where I am now executing geodetic operations, and I hasten to give you the results.

1st June; clear weather; on Mount Bauchard; noon, wind from the south; steady and pretty strong; the two thermometers placed in the direction of the meridian.

Elevation of the lower station,	686 metres,	Lower Thermometer,	+23°C.
" " higher "	890 "	Higher "	+19°
Difference of levels,	204 "	Difference from below upwards,	— 4°

Horizontal distance of stations, 1000 metres. Mean slope, 12°.

4th June, on Mt. Mielavre de Bouisse, 2 o'clock, P. M.; weather clear; wind north-east and pretty steady, about as strong as the south wind of 1st June; the two thermometers placed in the direction of the wind.

Elevation of lower station,	641 metres,	Lower Thermometer,	+27°C.
" " upper "	865 "	Upper "	+24°
Difference of levels,	224 "	Difference from below upwards,	— 3°

Horizontal distance of stations, 700 metres. Mean slope, 18°.

Latitude of the places of observation, 43°.

On the 31st May, in clear weather, and with a strong south wind, I found the thermometer rise 4·5° C. in less than half an hour, while descending the nearly perpendicular Rock of Bugarach, whose elevation is 1230 metres, and its measured height 180 metres.

I must also tell you that on the 3d June, the weather being calm and very clear, between 5 and 7 o'clock, A. M., I went from the village of Argues (Aude) up Mount Ournes, rising more than 500 metres above the village, without perceiving any lowering of the thermometer. On the contrary, when I arrived at my signal, it was $\frac{1}{2}$° C. higher than at the village.

Ibid, June 25, 1849.

Translated for the Journal of the Franklin Institute.

Determination of the Velocity of Light by Experiment. By M. Fizeau.

I have succeeded in making the velocity of light sensible, by a method which appears to me to furnish a new mode of studying with precision this important phenomenon. This method is founded on the following principles. When a disk turns with rapidity in its own plane, around its centre of figure, we may determine the time employed by a point in its circumference in describing a very small angular space, such as, for instance, $\frac{1}{1000}$ of its circumference. When the velocity of rotation is great enough, this time is very small: for 10 and 100 turns per second, it is only $\frac{1}{10000}$ and $\frac{1}{100000}$ of a second. If the disk has its circumference divided, like a toothed wheel, into equal intervals, the alternate arcs of which are removed, we shall have, for the time of passage of each interval through the same point of space, the same very small fractions.

During intervals of time so short as these, light passes over quite small spaces; 31 kilometres (19·5 miles) for the first fraction, and 3 kilometres (2 miles) for the second.

In considering the effects produced when a ray of light traverses the divisions of such a disk while moving, we find this consequence: that if the ray, after its passage, is reflected by a mirror, and sent back towards the disk, so as to meet it again at the same point in space, the velocity of propagation of the light will intervene, so that the ray will traverse it or be intercepted, according to the velocity of the disk, and the distance at which the reflection takes place.

On the other hand, a system of two telescopes, directed the one towards the other, so that the image of the object glass of each of them will be formed in the focus of the other, possesses properties which permits us to realize the above conditions in a simple way. It is sufficient to place a mirror in the focus of one, and to modify the eye-piece of the second, by placing between the focus and the eye-glass a transparent glass inclined 45° to the axis, and receiving laterally the light of a lamp, or of the sun, which it reflects towards the focus. With this arrangement, the light which traverses the focus within the limits (supposed very small) of the image of the object-glass of the second telescope, is thrown towards that glass, is reflected at its focus, and returns, traversing the same space, to pass again through the focus of the first telescope, where it can be observed through the glass by means of the eye-piece.

This arrangement succeeds very well, even when the telescopes are separated by a considerable distance. With telescopes of 6 centimetres (2·5 inches) aperture, this distance may be 8 kilometres (5 miles) without too much enfeebling the light. We then see a luminous point like a star, formed by the light which has passed from this point, traversed a space of 16 kilometres, (10 miles,) and then returned to pass again exactly through the same point before coming to the eye.

It is exactly through this point that the teeth of the turning disk must pass to produce the effects indicated. The experiment succeeds very well, and we observe that, according as the velocity of rotation is greater or less, the luminous point shines brightly or is totally eclipsed. Under the circumstances in which the experiment was made, the first eclipse was produced at about 12·6 turns per second; with a double velocity, the point shone again, with a treble velocity a second eclipse was produced, and when the velocity was quadrupled the point again shone, and so forth.

The first telescope was placed in the belvedere of a house situated at Suresnes, the second on the heights of Montmartre, at an approximate distance of 8633 metres. (5·37 miles.)

The disk, having 720 teeth, and mounted on a train of wheels moved by a weight, was made by M. Froment; a counter attached to it allowed us to measure the velocity of rotation. The light was taken from a lamp so arranged as to give a source of very bright light.

The first experiment gave a value for the velocity of light differing very little from that admitted by astronomers. The mean deduced from the 28 observations which I have hitherto been able to make is 70,948 leagues, of 25 to the degree, per second. Ibid, July 23, 1849.

Translated for the Journal of the Franklin Institute.

Shooting Stars. *Extract of a Letter from* M. Coulvier—Gravier *to* M. Arago.

Our observations upon shooting stars continue with the same exactitude since the month of November last. They are made at the Luxembourg palace, where the Government has provided an observatory for us.

As we have always remarked, the number of meteors was very small in the first half of the year; but from the beginning of July this number progressively increased, and the maximum took place about the tenth of August.

I subjoin the law of this increase, by reducing the observations to the hourly number at midnight.

1849 July 10,	6	shooting stars.	1849 July 26,	26	shooting stars.
11,	8	"	27,	28	"
13,	10	"	28,	33	"
14,	7	"	Aug. 6,	50	"
15,	10	"	8,	160	"
20,	13	"	9,	107	"
21,	13	"	10,	120	"
22,	12	"	11,	80	"

Ibid, Aug. 13, 1849.

Translated for the Journal of the Franklin Institute.

Memoir on the Polarization of Light. *By* MM. F. De la Provostaye and P. Desains.

By operating on solar heat, and passing it through an achromatized spar, the authors have arrived at the following results:—

1. That the law by which, according to Malus, the intensity of a ray, completely polarized, divides itself between the ordinary and extraordinary images to which it gives rise in passing through a spar, is applicable to heat as well as to light.

2. That the variations which the intensity of polarized heat undergoes, in its reflection from glass under different incidences, are exactly represented by the formulæ which Fresnel has given for light, admitting that the solar heat which has passed through the prism has an index but little differing from 1·5.

3. That there is the most perfect resemblance between the phenomena which polarized light and heat present when reflected from polished metals.

Ibid, July 30, 1849.

Strength of Gutta Percha Tubing.[*]

A series of interesting experiments have just been concluded at the Birmingham Waterworks, relative to the strength of gutta percha tubing, with a view to its applicability for the conveyance of water. The experiments were made (under the direction of Henry Rofe, Esq., Engineer,) upon tubes three-quarters of an inch diameter, and one-eighth of gutta percha. These were attached to the iron main, and subjected for two months to a pressure of 200 *feet head of water*, without being in the slightest degree deteriorated. In order to ascertain, if possible, the maximum strength of the tubes, they were connected with the Water Company's hydraulic proving pump, the regular load of which is 250 lbs. on the square inch. At this point the tubes were unaffected, and the pump was worked up to 337 lbs.; but, to the astonishment of every one, the tubes still remained perfect. It was then proposed to work the pump up to 500 lbs., but it was found that the lever of the valve would bear no more weight. The utmost power of the hydraulic pump could not burst the tubes.

The gutta percha being somewhat elastic, allowed the tubes to become slightly expanded by the extraordinary pressure which was applied, but on its withdrawal they resumed their former size.

Wire Work Fire-Proof Ceilings.[†]

Fire-proof ceilings of wire work have been successfully applied, in place of lath, with plaster and stucco, as usual, at the Chester Lunatic Asylum.

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[*] From the London Mechanics' Magazine, for July, 1849.

[†] From the London Builder, for July, 1849.

The wires are about $\frac{1}{4}$ in. apart, and the plaster forms an adhesive and serviceable mass, even on both sides. The wire is galvanized or japanned, to prevent corrosion. Not only ceilings, one would think, but thin partitions and walls in general, might be wired in place of lathed, and risk of fire thus greatly diminished by a process neither patented nor costly.

Self-Heating Shot for War Purposes.[*]

"We saw, the other day," says the Glasgow Chronicle, "in the establishment of Mr. Field, tin-plate worker, Argyll street, a peculiar and apparently most valuable mode of obtaining red-hot shot for large guns. It is the invention of Mr. Scouller, the foreman in Mr. Field's workshop, and consists in the filling the hollow shot with a highly combustible powder, the composition of which we are not yet at liberty to make public. Two or three fuse holes are made in the shot, so that, when fired from the piece, ignition takes place, and the shot is made red-hot before it arrives at its destination. In the trial we saw, the shot, which was about $2\frac{1}{2}$ inches diameter, was simply laid on the ground, and the composition was ignited by a light applied to the fuse hole. Violent combustion immediately ensued; liquid fire appeared to stream from its three fuse holes, and the material became quite red-hot in a few seconds. The inventor states that, when fired from a gun, a red heat will be attained in less than 20 seconds from its leaving its mouth. The composition will burn under water. It is easily made, and there is little doubt as to its efficiency for war purposes, in place of the present expensive and troublesome system of heating, the shot being put into a gun in a cold state, as with ordinary solid balls."

FRANKLIN INSTITUTE.

Proceedings of the Stated Monthly Meeting, November 15*th*, 1849.

Thomas Fletcher, Vice President, in the chair.
Solomon W. Roberts, Corresponding Secretary.
Isaac B. Garrigues, Recording Secretary.
John F. Frazer, Treasurer.

The minutes of the last meeting were read and approved.

Letters, acknowledging donations, were read from the Royal Geographical Society of London, and the American Philosophical Society of Philadelphia.

Donations were received from—Joseph Fletcher, Esq., London; The Royal Cornwall Society, England; The Polytechnic Society of Bavaria; Samuel J. Fisher, Esq., Paris, France; Thomas Ewbank, Esq., Washington City, D. C.; B. H. Latrobe, Esq., Wm. Minifie, Esq., Baltimore, Md.; The Prison Discipline Society, Boston, Mass.; Hon. Joseph R. Ingersoll, James Swaim, Esq., The Controllers of the Public Schools, Mr. George S. Appleton, and Solomon W. Roberts, Esq., Philadelphia.

Donations to the Cabinet of Models were received from Mr. J. F. Mascher, Philadelphia.

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[*] From the London Civil Engineer and Architect's Journal, for September, 1849.

The Treasurer's statement of receipts and payments for the months of September and October, was read.

The Board of Managers and the Standing Committees reported their minutes.

The Committee on Exhibition submitted their Report of the late Exhibition of American Manufactures, and recommended the award of Gold Medals to Joseph Dixon, Cornelius & Co., and Archer & Warner.

When, on motion,—

A Gold Medal was awarded to Joseph Dixon, of Jersey City, N. J., for his manufacture of Cast Steel.

A Gold Medal was awarded to Cornelius & Co., of Philadelphia, for the workmanship of their Gilded Chandeliers, and for the successful introduction of Electro-Gilding into the manufacture of Lamps, &c.

A Gold Medal was awarded to Messrs. Archer & Warner, of Philadelphia, for the great improvement exhibited in their workmanship, and especially for the beauty and grace of their original patterns.

Resignations of membership were read and accepted.

New candidates for membership in the Institute were proposed, and those proposed at the last meeting were elected members of the Institute.

Prof. Frazer offered the following preamble and resolution, viz —

Whereas, it is understood that a journal devoted to the publication of Astronomical Observations, and papers upon Practical Astronomy, is about to be issued at Cambridge, Mass., and

Whereas, the Franklin Institute of the State of Pennsylvania highly approves of all endeavors to encourage the cultivation of science in our country; therefore,

Resolved, That the Committee on the Library be instructed and empowered to subscribe for a copy of the Astronomical Journal, edited by B. A. Gould, Jr., Esq., of Cambridge, Mass.

Which was referred to the Board of Managers, with power to act.

On motion of Mr. W. P. Foulke, it was

Resolved, That the committee charged with the arrangement of Geological Specimens deposited by the City of Philadelphia, be requested to report in writing, at the next stated monthly meeting of the Institute—

1st, Whether or not that collection has been arranged for general use.

2d, If not, the reasons in detail which have delayed the arrangement.

M. Cardeza exhibited a breech-loading rifle, the invention of Mr. C. Sharp. In this gun, by depressing the lever, the breech is drawn down sufficiently to introduce a cartridge into the gun. On the side of the gun is a magazine of caps, through which the tube travels; the caps so present themselves, that when the lever is brought up, the cap is raised with it; when the gun is re-primed the old cap is thrown off. The cartridge, which is made a little longer than the chamber, is cut off by the breech, when elevated, thus exposing the powder to the action of the cap.

J. G. Morris, Esq., submitted several specimens of antique watches, made at Nuremberg in the 15th century.

The history of these was briefly alluded to by the Chairman. The lateness of the hour required the postponement of numerous subjects until the next meeting.

AMERICAN PATENTS.

List of American Patents which issued in the month of July, 1843, *with Exemplifications by* CHARLES M. KELLER, *late Chief Examiner of Patents, in the U. S. Patent Office.*

1. For *an Improvement in Water Wheels;* James Finley, assignee of J. Whitlow and James Stirrat, City of New York, July 3.

The patentee says,—"My improvement in these arms for which I claim letters patent, consists in my making them to diminish regularly in the capacity of their cross sections in such a manner as that the areas of such sections shall correspond with the velocity due to the water in its passage from the point at which it enters the arms to that at which its escapes therefrom; the same being calculated and graduated upon the principles herein made known. The advantages of this mode of construction is that no portion of the efficient water will be carried round by the centrifugal action of the arms, to an injurious extent; the whole being rendered efficient in the production of propelling power. It will be manifest, however, that although a near approximation may be made to the attainment of the proposed end, it is not possible in the nature of things to arrive at absolute precision in the mechanical construction of the hollow arms, and that some variation may also be admitted without sensibly changing the result. It will be seen, for example, that for some small distance from the centre of motion the velocity of revolution will be comparatively slow, and consequently the cross sectional areas may, for such limited distances be equal."

Claim.—"I do not intend, therefore, to limit my claim to such structures only as shall present the utmost attainable precision, but to embrace therein such hollow arms or apertures as are formed upon the principles herein made known, and the action of which, in consequence of such formation, is substantially the same in its results with that herein set forth. I do not claim any of the parts described which are old or known separately, nor otherwise than and in so far as the same are newly combined, modified, adjusted and arranged."

2. For an *Improvement in the Machine for Cleaning Cotton before Ginning;* B. Seguine, City of New York, July 3.

The patentee says,—"The nature of my invention consists in constructing a machine that will clean all the dust and dirt from cotton after it is picked, before it is put into the gin, by which means less care is required in picking and a more perfect article is produced; the cotton being less liable to nap in passing through the gin."

Claim.—"What I claim as my invention, is making the casing for the conical beaters with the lower half enclosed with flat bars or slats, one of the edges of each of which project inward, so as to bring the cotton in contact with that edge; and in combination therewith the upper half made with round bars or grating for the escape of dirt, constructed substantially in the manner set forth."

3. For an *Improvement in Machinery for Dressing or Finishing Worsted, or other Threads or Cords*; Benjamin B. Tilt and James Skinner, Roxbury, Norfolk county, Massachusetts, July 8.

Claim.—"What we claim as our invention, is the combination of the rubber frame with the delivery and receiving bobbins; also the combination of the guide plates with the said rubber frame and bobbins, the whole being arranged together and operating as set forth."

4. For an *Improvement in the Machine for Forming the Eyes of Wrought Iron Butt Hinges;* John F. Winslow, assignee of W. Whittaker, Albany, New York, July 8.

The patentee says,—"The nature of my invention consists in folding or bending the metal plate or blank butt previously cast and prepared of the proper dimensions, so as to form the eye or joint by a single operation of the machine.

Claim.—"What I claim as my invention, is the combination of the tumblers, cam, carriage and gauge, constructed, arranged and operated in the manner set forth."

5. For an *Improvement in Metal Roofing for Houses;* J. G. Wooden, Cincinnati, Hamilton county, Ohio, July 8.

Claim.—"What I claim as new is the insertion in the laps of each seam of a cord of any suitable kind of yarn, a strip of cloth, or other appropriate fibrous material, and the confining the same in place by flattening down the seams, as set forth.

6. For an *Improvement in Cane Cutters;* John P. Bryan, Princeton, Caldwell county, Kentucky, July 8.

Claim.—"What I claim as my invention is the form of the knives, their oblique application, and the method of arranging them in conjunction with the runners or carriage, as set forth."

7. For an *Improvement in Wagons and other Carriages;* Horace Wood, Greenwich, Washington county, New York, July 8.

The patentee says,—"The nature of my invention consists—1st. In arranging the spokes in the wheels so as to prevent the rim from bending in at the joints by dividing the felloe into eleven parts, and putting the spokes about two parts from the ends; which makes a short space where the joints are, and long in the centre. 2d. In making the axletrees less liable to break or spring down by making them on the principle of an arch.

Claim.—"What I claim as my invention, is—1st. The arrangement of the spokes in the felloes near together at the joinings of the felloes in the manner described, to prevent the end from bending in at the joints. 2d. Inserting the iron tension rods through the arms of the axletree so that the nuts on the end shall act as abutments to the arch, and thus give greater strength to the arched axletree, in the manner set forth. 3d. The employment of a ball and socket joint to connect the axletree with the carriage, to give free play in all directions to the axletree, as described; and 4th. The arch perches in combination with the tension rods, for the purpose and in the manner set forth, and applying the same to all kinds of wagons and carriages where the nature of the work will admit."

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8. For an *Improvement in Cutting Garments;* David N. Sipperly, City of Troy, Rensselaer county, New York, July 8.

Claim.—"What I claim as my invention, is the flexible protractor, and the application thereof for coat measurement and drafting."

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9. For an *Improvement in Tailors' Measure;* Cyrus Mory and David Hummer, McArthurstown, Athens county, Ohio, July 8.

Claim.—"What we claim as our invention, is the graduated scale of measure, whereby the measure of each subject is made the base of a scale which of itself answers for every part of the garment, more simple and easier to be understood, as one scale, with 12 sizes, will answer for cutting an entire suit; whereas, with the usual scales, not less than forty or fifty sizes, and at least three different scales are used for every possible difference in measure. We also claim as our invention, the plane protractor attached to the square, instead of the semi-circular, and the mode of projecting the divisions from the centre, by inches and tenths or hundredths, from the scale of equal parts, to produce the desired effect and a proper adjustment of every portion of the garment."

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10. For an *Improvement in Bedsteads;* John Morris, Derby, New Haven county, Connecticut, July 8.

The patentee says,—"The nature of my invention consists in placing springs under the sacking bottom of a bedstead in such a way as to form an elastic bed; the centre of the springs being fastened to a rail, that is attached to the head and foot rail at their centres, the ends of the said springs being fastened to the sides of the sacking, which is stretched over two rollers extending from the head to the foot posts, one on each side."

Claim.—"What I claim as my invention, is the combination of the springs, rollers, and sacking, in the manner and for the purpose set forth. I also claim in combination with the above, the centre strap for sustaining the sacking at that point, as set forth."

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11. For an *Improvement in Machinery for the Manufacture of Oat Rum;* Thadeus, Henry and Daniel Tibbals, Chatham, Middlesex county, Connecticut, July 8.

Claim.—"What we claim as our invention is the combination of the boiler having a partition in the middle, with openings at each end, with the paddles and furnace, as set forth, and for the purposes set forth."

12. For an *Improvement in Cooking Stoves;* Albert D. Hart, Pittsfield, Berkshire county, Massachusetts, July 8.

Claim.—"What I claim as my invention, is the arrangement of the flues in the rotary plate, and the combination of said plate with the stove, as set forth. I also claim the manner in which I have combined the rotary plate and stove with the elevated oven."

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13. For an *Improvement in Machines for Sawing Clap Boards;* D. Bartholomew, Wolcott, Danville county, Connecticut, July 8.

The patentee says,—The nature of my invention consists in the manner of feeding the saw, by means of a double reverse threaded screw, in setting the log, and in adjusting the saw to the size of the log, as described."

Claim.—"What I claim as my invention, is the method of raising the lever for setting the saw, by means of a lever constructed and arranged as set forth."

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14. For an *Improvement in Sizing Yarn by Steam;* H. A. Fletcher, Shelburn, Chittenden county, Vermont, July 8.

The patentee says,—"The nature of my invention consists in the application of the sizing material by means of steam."

Claim.—"What I claim as my invention, is the application of the sizing material to the yarn by means of steam, as set forth, and using for that purpose gum arabic, in connexion with glue."

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15. For an *Improvement in Brick Machines;* Lee Montgomery, Tunnel, Alleghany county, Maryland, July 8.

The patentee says,—"The nature of my invention consists in combining a wheel, the periphery of which is indented with a series of brick moulds, with an antagonist wheel having projections on it which shall force the clay into the moulds; said projections being sufficiently convex to make the face of the brick next it straight."

Claim.—"What I claim as my invention, is the moulds having flaring mouths, so as readily to admit the projections on the wheel to work into it and deliver the bricks freely, placed around the periphery of the wheel, constructed and arranged as set forth. I also claim the combination of the wheel, having projections on it with convex surfaces with the moulds constructed, arranged and combined in the manner and for the purpose set forth. Lastly, I claim in combination with the above the sliding board and roller, in the manner set forth."

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16. For an *Improvement in Iron Pavements for Streets;* William D. Berry, Boston, Massachusetts, July 12.

The patentee says,—The nature of my improvement consists in covering the surface of the street with boxes made of iron of any convenient form and size, divided into sections, (which sections are to be so small as not to admit the hoofs of a horse,) by compartments of iron, which are so arranged as to strengthen the whole, and together with the rim of the boxes, are groved in such a manner as will most effectually prevent the feet of horses, or wheels of carriages, from slipping. The boxes are keyed or linked together, and the interstices or sections are to be filled with any composition which may be procurable in the section of country where the pavement may be used, and which may be found suitable to the purpose. Among the compositions which may be used, I name asphaltum, and a composition made of stone and shells, broken small and mixed with hydraulic, or other cement."

Claim.—"What I claim as my invention, is the manner of using iron in the pavement of streets, by means of boxes connected by flanches or keys and commissures, and divided into small sections, which leave openings or interstices, to be filled inside and between the rims with an composition which may be best adapted to the purpose. Using for that purpose boxes of any form, divided into sections in any manner which will produce the intended effect."

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17. For an *Improvement in Casting Boxes for Carriage Wheels;* James Mollineux, Northampton, Lehigh county, Pennsylvania, July 12.

Claim.—"What I claim as my invention is, 1st, the combination of the jaws and top and bottom plates, with the movable core, constructed and arranged as set forth. 2d. I claim in combination with the above, the gate opening into the side of the mould, with a long narrow mouth, reaching nearly from top to bottom of the casting, as set forth.

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18. For an *Improvement in the Mode of Constructing Andirons;* E. Smylie, City of New York, July 12.

Claim.—"What I claim as my invention, is the combination of the safety bars with the andirons, as the whole is set forth."

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19. For an *Improvement in Self-operating Brakes for Railroads;* Henry C Sides, Baltimore, Maryland, July 12.

The patentee says,—The nature of my invention consists in arranging brakes so that when the rod by which the car is drawn is checked back, the brake will act; the arrangement being such as to shift and act when the car is going in either direction; the method of pressing the brake against the wheels being so arranged as to admit of the most powerful action."

Claim.—"What I claim as my invention is, 1st, the manner of combining the draw rod with the brakes, for the purpose described, by means of the stud and notches in the slot of the piece. 2d. I claim the employment of a draw rod having a long slot in the centre, which embraces the spring, so as to allow it a longitudinal motion, independent of the spring, for the purpose set forth. 3d. I claim the shifting apparatus for causing the brakes to act when the cars run either way; that is to say, the piece and the lever, rod and shaft by which it is moved, combined and arranged, substantially in the manner set forth."

20. For an *Improvement in the Reaction Water Wheel;* Daniel H. Parsons, Chester, Meigs county, Ohio, July 12.

Claim.—"What I claim as my invention is, 1st, the manner of forming the buckets. 2d. The construction and application of the counter balance, as set forth; that is to say, by enclosing it within an outside case, so as to present a smooth outside surface to the action of the water when used in combination with reaction water wheels."

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21. For an *Improvement in Constructing an Apparatus for Manufacturing Salt;* Henry Smith, Salina, Onondaga county, New York, July 12.

The patentee says,—"In constructing my apparatus for the manufacture of salt from brine, or of other articles of a similar nature, I form the jambs of the arches in which the kettles are to be set, of large metallic cases or boilers, either of wrought or cast iron. When a single arch is used, two such metallic cases will be required, but where there are two arches, which will generally be the case, three such cases will be required. These cases take the places of the sides and intermediate walls of masonry generally employed. They are to be connected together by tubes which reach across from one to the other of them, and constitute the grate bars upon which the fuel is to be placed. These tubes are to be at such distances apart as to allow of the falling of live coals and brands between them, which are to burn on the bottom of the ash pit, by which the heat will be economised, as the lower part of the tubes and of the metallic cases will be thereby more effectually heated."

Claim.—"What I claim as my invention, is the manner in which I have arranged the metallic boilers or cases in the jambs of the arch, and the tubular grate bars by which they are connected, in combination with the evaporating kettles situated above and between the said boilers, for the purpose of manufacturing salt, as set forth."

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22. For an *Improvement in the Machine for Carding and Roping Wool, Cotton, and other Fibrous Matter;* John Boynton, South Coventry, Tolland county, Connecticut, July 12.

Claim.—"What I claim as my invention, is taking off the wool or roping from the doffers between two revolving cylinders to each doffer, the upper cylinder resting on the under one, for the purpose and in the manner set forth. I likewise claim the arrangement of the vibrating cylinder, each resting on two condensing cylinders in such manner as to obtain two bearing points on the roping instead of one for each vibrating cylinder, as set forth."

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23. For an *Improvement in the Construction of Scythe Sneeds and Hanging Scythes;* George Farquhar, Easton, Northampton county, Pennsylvania, July 12.

Claim.—"What I claim as my invention, is the combination of the additional arm and brace with the scythe sneed, the whole being constructed and operating as set forth."

24. For an *Improvement in the Construction and Heating of Furnaces;* Christian E. Detmold, City of New York, July 15.

The patentee says,—"My invention is intended as an improvement on the process of an apparatus for applying the gas from blast and other furnaces to the manufacture of bar iron, and to other purposes, invented by Van Faber du Faur, and for which letters patent of the United States were granted to me as the assignee, and consists in the arrangement and combination of an apparatus for the especial purpose of generating combustible gases from any kind of fuel; by the combination of which gases, the furnaces or other structures are to be heated, and of an hot air chamber, blow pipes, &c."

Claim.—"What I claim as my invention is, 1st, the combination of a chamber of combustion for the sole purpose of generating combustible gases with refining, puddling, heating, or other furnaces, with those of steam boilers, ovens, or any other apparatus for generating heat; said combination being made substantially in the manner set forth. 2d. I claim the particular arrangement and combination of the hot air chamber, the blow pipes, the arch of fire brick, and the range of fire brick or fire clay, over the gas generating chamber, by which the blow pipes are protected from the effects of the heat. I do not claim to have invented the use of combustible gases for the heating of furnaces, in combination with streams of heated and compressed air, nor the application of the blow pipe to furnaces, this being known as De Faber's invention; but I do claim the above described manner of arranging and combining the chamber for generating the combustible gases, the hot air chamber, blow pipes, and the fire proof arch for their protection when applied to any kind of furnace or other apparatus for generating heat."

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25. For an *Improvement in Bending Metal Sheets for Roofing, &c.;* John Iggett, Albany, New York, July 15.

The patentee says,—"The nature of my invention consists in machinery for bending sheets of metal for covering roofs at their edges, so as to allow for their expansion and contraction, and also for forming caps for the same. Each sheet of metal is bent up at the edge at right angles, and its upper part is again bent at right angles parallel with and over the flat part that lays upon the roof; two of these are laid side by side and the upper horizontal parts are embraced by a cap or strip of metal that lays over them, and the edges turn down under them."

Claim.—"What I claim as my invention, is the combination of the lower folding bar worked by screws, and the upper folding bar with jaws, formed by the brace, and horizontal bar, constructed and arranged as set forth. 2d. I claim the combination of the grooved bed piece, bar and levers, constructed and arranged as set forth."

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26. For an *Improvement in Cheese Presses;* Hartwell Kendall, Danby, Rutland county, Vermont, July 15.

Claim.—"What I claim as my invention, is the combination of the ratchet wheel, lever and crank, with the windlass or arbor of a lever press, constructed and arranged substantially in the manner and for the purposes set forth."

27. For an *Improvement in Clap-board Machines;* Daniel Newton, Dalton, Coos county, New Hampshire, July 20.

Claim.—"What I claim as my invention, is the hanging the shaft of the saw so that one end of it can be raised or lowered, in combination with the cam and sliding box, for the purpose set forth. And I claim the method of regulating the set of the log or plank, by means of the index wheel on the shaft of the wheels that move the carriage, in combination with the sliding steel pin and inclined surface, substantially as set forth."

28. For an *Improvement in Obtaining Wire from Iron, Steel, Copper, Brass, Gold, Silver, &c.;* Thomas Wallace, Derby, New Haven county, Connecticut, July 20.

The patentee says,—"Instead of rolling the metal into rods or strips, as heretofore, I cause it to be made into cylinders or hoops by casting, welding or rolling, or a combination of them, as the various metals may require, and of such diameter, breadth, thickness, and quality, as may be convenient. I then, with circular shears, begin to cut from the edge of the cylinder or hoop of metal a strip or thread of metal of any desired width, and so cut in one continuous strip or thread until the whole cylinder or thread is cut out."

Claim.—"What I claim as my invention, is the cutting of a cylinder of metal, or hoop of metal, into a strip of metal, or thread of metal, for the purpose of making wire."

29. For an *Improvement in Augers;* Raymond French, Derby, New Haven county, Connecticut, July 20.

The patentee says,—"The improvement consists in forming the double twist auger with a single cutting lip, and this is successfully effected by so twisting the pod of the augers that one of the hollows becomes deeper than the other, and the deepest hollow is connected with the cutting lip. The superiority of the auger thus made consists in this—that it is stronger, less liable to spring or bend, and more durable than the single twist auger, and also in boring more rapidly and making a straighter hole than the common double twist."

Claim.—"What I claim as my invention, is the combination of a double twisted plate or pod auger, having its hollows of unequal depths, with a single cutting lip, by whatever process the plate may be twisted."

30. For an *Improvement in Clover Hullers;* J. K. Mitchell, Danville, Columbia county, Pennsylvania, July 20.

The patentee says,—"The nature of my invention consists in the construction of a hulling cylinder and concave so as to hull grain more perfectly, and attaching thereto a "shaker" and fan in such a way as to clean the seed perfectly, and separate the chaff from the tailings."

Claim.—"What I claim as my invention, is the combination of the runner and concave, constructed and arranged as set forth. I also claim the arrangement of the sieves in the manner set forth."

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31. For an *Improvement in the Machine for Sweeping Streets;* Pliny Robinson, Leonardsville, Madison county, New York, July 20.

The patentee says,—"The nature of my invention consists in the employment of a revolving oblique brush attached to a frame drawn by horse or other power, for sweeping streets and other similar purposes, and loading the dirt into carts."

Claim.—"What I claim as my invention, is the combination of the oblique revolving brush, with a carriage, for sweeping streets, &c.; the motion of the brush being taken from the wheels of said carriage, constructed and arranged in the manner set forth."

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32. For an *Improvement in Sawing and Planing by Combining a Plane with a Saw;* Elijah Pratt, North Granville, Washington county, New York, July 20.

The patentee says,—"The nature of my invention consists in connecting with the saw of a saw-mill a plane in the same frame, both being held by the same stirrups; and also the method of constructing the plane therefor."

Claim.—"What I claim as my invention, is the combination of the plate containing the plane, constructed and arranged as set forth, with the saw of a saw-mill, in the manner and for the purpose set forth."

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33. For an *Improvement in the Construction of Hydrants;* Robert H. Colvin, Columbia, Lancaster county, Pennsylvania, July 20.

The patentee says,—"The nature of my invention consists in forming and arranging the joints and valves of a hydrant so as to prevent leakage under the heaviest pressure, and also from wear."

Claim.—"What I claim as my invention is, 1st, combining the rod and cap in the manner described so that they closely fit the bore and excavation made to receive them, and break joint to prevent leakage, as set forth. I claim the movable pin and collar for stopping the waste pipe, in combination with the valve and rod, constructed and arranged as set forth."

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34. For an *Improvement in the Pistons and Stuffing Boxes of Steam Engines;* E. K. and C. Eversole, St. Louis, Missouri, July 20,

The patentees say,—"Our first improvement consists in the manner of constructing the piston so as to give to it a degree of elasticity independent of that existing in the ordinary hemp or other elastic packing, by means of which arrangement we are enabled to run an engine for seven or eight days without its being necessary to take off the cylinder head for the purpose of repacking. Our second improvement consists in the manner in which we construct the stuffing box of the cylinder."

Claim.—"What we claim as new, is, 1st, the manner in which we construct our elastic piston by securing the main body thereof and the follower together, by means of screw bolts passing through spiral springs, as described, so that the follower shall have a yielding motion to and fro, in the manner and for the purpose set forth. 2d. We claim the constructing of the stuffing box of the piston rod, so as to allow of a lateral motion to the same so far as to compensate for any ordinary deviation of the cylinder from its correct position; such lateral motion being attained by an arrangement of the respective parts, substantially as set forth."

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35. For an *Improvement in the Machine for Drilling Iron, &c.;* Amos Morgan, Wooster, Wayne county, Ohio, July 20.

The patentee says,—"The nature of my invention consists in connecting springs with a drill so as to be confined in a box and have a limited action; the stock of said drill being furnished with a screw and movable nut on it to draw back the drill when the hole is made; the springs serve to keep up the proper pressure on the drill on the iron while in operation."

Claim.—"What I claim as my invention, is the combination of the spring drill with the set screw and nut for gauging the depth which the drill is to enter, and allowing it to feed as it bores, and be drawn back rapidly."

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36. For an *Improvement in the Manufacture of Hats and Bonnets of Horse Hair;* Charles L. Nor, City of New York, July 20.

The patentee says,—"The nature of invention consists in the application of horse hair, white particularly, and all other colors, if necessary, in the manufacture of ladies' and gentlemen's hats and caps."

Claim.—"What I claim as my invention, is in the sewing the edges of the braid together with horse hair, which gives the hat or bonnet the appearance of being made in one piece, and also saves about one-third of the braid required for a hat or bonnet made in the ordinary way, and makes them lighter, more durable, and also more pleasant to the wearer, and are not so liable to injury in the process of cleaning."

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37. For an *Improvement in the Manner of Opening and Closing the Valves of Steam Engines;* F. E. Sickels, City of New York, July 20.

Claim.—"What I claim as new, is the application of the cam and lever in conexion with any of the ordinary apparatus for working the exhaust valves of steam engines, or in any otherwise, so as to effect the quicker opening of the exhaust valves at or near the first periods of their movements, and the quicker closing of the exhaust valves at or near the last periods of their movements.."

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38. For an *Improvement in Machines for Cleaning Unginned Cotton;* Robert M. Livingston, Mobile, Alabama, July 20.

Claim.—"What I claim as my invention, is the peculiar construction of the fanner, not in its spiral form, but in its combination with beaters to be applied to the cleaning of unginned cotton, in freeing it of dirt, leaf, and trash."

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39. For an *Improvement in Electrifying Machines;* Elijah Cole, Richmond, Jefferson county, Ohio, July 22.

Claim.—"What I claim as new, is the combining of the electric, or plate to be excited, with the battery, and of operating the same by an arrangement of parts, as set forth; the electric being placed horizontally, and being made to rotate by means of the lever and its appendages; the battery, also, being composed of a series of coated plates, and being connected with the electric as set forth, and the whole being combined and operating substantially as set forth."

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40. For an *Improvement in Constructing Machines for Making Bread;* William Carr, Bath, Lincoln county, Maine, July 22.

Claim.—"What I claim as new, is the effecting the combined movement of the cylinders and brake, for the purposes specified."

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41. For an *Improvement in Ploughs;* John Moore, Lexington, Fayette county, Kentucky, July 22.

The patentee says,—"The nature of my invention consists in constructing a wrought iron plough so that it can be increased or decreased in size to answer for one or more horses, at pleasure, and be made with or without a cutter in front of the mould board, for breaking up or other ploughing."

Claim.—"What I claim as my invention, is the combination of the share with the mould board and land-side in the manner and for the purpose set forth."

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42. For an *Improvement in Constructing Horse Collars;* Nathan Post, Madrid, St. Lawrence county, New York, July 22.

Claim,—"What I claim as my invention, is the manner of constructing horse collars of felt, or felted cloth, or leather, in the way described, in combination with sponge stuffing, the whole being constructed and operating as set forth."

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43. For an *Improvement in the Mode of Casting Butt Hinges;* Richard W. Belson, Danville, Columbia county, Pennsylvania, July 26.

The patentee says,—"The nature of my invention consists in the manner of forming the metallic core and the combination of washers therewith for casting hinges, by which a more perfect joint is made and greater expedition and neatness insured."

Claim.—"What I claim as my invention, is constructing the core for casting butt hinges in the manner described, so that they can be removed from the pivot wire of the hinge, as set forth. I also claim in combination with the core, the metallic disks, as set forth."

44. For an *Improvement in Smut Machines;* Joseph Klein, Low Hill, Lehigh county, Pennsylvania, July 26.

The patentee says,—"The nature of my invention consists in the formation and arrangement of the beaters on the runner so as to clear the grain from smut in the most effectual way, the smut being driven by said beaters out of the case, which has oblong slits in it for that purpose, and cleaning the grain after leaving the machine."

Claim.—"What I claim as my invention, is the combination of the screen, inclined board and slide, with the fan and beaters, in the manner set forth."

45. For an *Improvement in Garlic Separators;* W. C. Grimes, City of New York, July 26.

The patentee says,—"My invention consists in the combination of two rollers of such form and material as to separate wheat and garlic when made to pass as they revolve in a thin sheet or stream between them."

Claim.—"What I claim as my invention, is the combination of a grooved roller with one formed in part of India rubber, or other elastic material, and operating as set forth. I also claim the combination of a comb or toothed plate with the grooved roller, the former being for the purpose of removing the garlic and other foreign matter from the grooves in the latter."

46. For an *Improvement in Machinery for Repairing and Improving Roads;* Samuel Mallory, Alexander, Genesee county, New York, July 26.

Claim.—"What I claim as my invention, is attaching the shears to the inclined sides of the frame having an opening at the rear for the escape of the earth, &c., and which can be closed with a gate, as set forth."

47. For an *Improvement in Threshing Machines;* William Eaton, Jr., Upper Alton, Madison county, Illinois, July 28.

Claim.—"What I claim is, 1st, the combination of the flutter shaft with the lattice band, in the manner described. 2d. The arrangement of the trash trough and the air duct, in combination with the lattice band. 3d. The arrangement of the additional seive, and also in combination with the threshing machine, the spiral conveyor and the elevator, as set forth."

48. For an *Improvement in the Manner of Constructing Steam Boilers;* Zenas C. Robbins, St. Louis, Missouri, July 28.

The patentee says,—"My boiler consists in two principal parts, one of which I denominate the double concentric boiler, and the other the larger boiler, or feeder. These are to be so connected together as to constitute one combined boiler or steam generator. Both of these boilers are cylindrical, and are, usually, both placed horizontally and parallel to each other. The double concentric boiler may be one-half, or one-third, more or less, of the length of the large boiler or feeder; in it is contained the furnace, the heat from which is to generate steam in the concentric boilers by which the furnace is surrounded, and likewise in the large boiler or feeder, for which latter purpose a flue leading from the double concentric boiler is carried twice through the large boiler, whence it escapes through a chimney."

Claim.—"I claim the manner of combining my furnace with the annular boiler, and with the large cylinder, as described under my third modification; the large cylindrical boiler being, in this case, substituted for what I have called the large boiler or feeder."

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49. For an *Improvement in Locomotive Engines:* Ross Winans, Baltimore, Maryland, July 28.

Claim.—"I claim as my invention, the construction and use of a locomotive engine, having either six or eight driving wheels, the angles of which are placed parallel to each other, and which are permanently to preserve this parallelism during the whole action of the engine, whether running upon straight or curved roads; the said angles having sufficient end play to allow the wheels, when the whole of them are provided with flanches, to adapt themselves to the curvatures of the road; or instead of this end play of the axles, the constructing of two of the pairs of wheels where eight are used, without flanches, the motive power from the steam engine to be transmitted to the first pair of driving wheels, through the intermedium of a fifth axle, furnished with spur wheels, which gear into small spur wheels or pinions on the axle of the first pair of driving wheels, and the power from these wheels being transmitted to the whole system of driving wheels, by means of cranks on the axles of said wheels and suitable connecting rods, as set forth. In the case where six driving wheels only are used, the locomotive engine may be similar in all respects to that having eight driving wheels, with this exception, that one pair of wheels are left out, or are not so connected as to constitute driving wheels, the pair not used as such not having cranked axles and connecting rods, whilst in all other respects the combination would be the same as when eight driving wheels are used. And a locomotive thus constructed with six driving wheels may be combined with any, either, or the whole of the devices mentioned in my second and third claims.

"2d. I claim in combination with an engine constructed as designated in my first claim, the apparatus for equalizing the pressure upon the contiguous wheels, which apparatus consists of a vibrating spring, connected by rods with the boxes of the driving wheels, or of a vibrating lever and spring analogous thereto, in the manner set forth. And although I have, as I believe, fully set forth and designated the combination of parts, devices, or elements necessary to the construction of a locomotive engine upon the plan invented by me, I do hereby further declare, that I do not claim either of the respective parts, devices or elements, taken individually; but that I claim them only as combined with each other in the manner designated in my first recited claim, and with or without the respective devices designated in my second claim. Nor do I claim the arrangement either of six or eight driving wheels in a locomotive, the axles of which continue parallel (and which constitutes the first element of the foregoing claims,) when actuated by connecting rods and cranks, as in my fourth element, and having a lateral and vertical vibration, described in my second and seventh elements in the description, but differing substantially in the mode of communicating the power to the first pair of driving wheels forming the third element of my improvements."

50. For an *Improvement in the Safety Valve for Steam Engines;* Wm. Duff, City of Baltimore, Maryland, July 28.

The patentee says,—"My improvement consists in causing a portion of the water from the boiler to constitute a portion of the weight that is to bear upon the safety valve of a steam engine."

Claim.—"What I claim as new, is the employment of a portion of the water contained in a steam boiler, to constitute the weight, or a part of the weight, by which a safety valve is to be held down, and which water will cease to constitute such weight when it has descended to a given level; the said weight of water being rendered effective by means of apparatus, constructed and arranged substantially in the manner set forth."

51. For an *Improvement in the Machine for Sweeping or Cleaning Streets;* Alexander Jones, City of New York, July 28.

Claim.—"What I claim as new, is the manner in which I have arranged the revolving brush wheel so as to turn on the rear brush ends of the vibrating arms, or levers, that have their fulcrum on the main axle of the cart wheels, in combination with the shoe and endless apron attached to the main or cart frame; the shoe being suspended by a chain or cord to the arms, by which arrangement the brush and shoe may be lifted up from the street, and by the flexibility of the chain, the brush may be made to bear with any degree of pressure upon the shoe. I do not claim the brush, shoe, and endless apron, independently of this particular arrangement. I do not intend to limit myself to any particular material for forming the revolving brushes, as these may be made of splints of any suitable kind of wood, of whalebone, or of other elastic material. The splints or fibres may be firmly confined between bars of metal by intervening rods of iron; the whole being confined by means of screw bolts; and it will be found advantageous to have the fibres of double the required length, so that they may be folded together in the manner of bristles in those brushes where they are secured by wires."

52. For an *Improvement in Uterine Supporters;* A. H. McNair, City of Philadelphia, Pennsylvania, July 28.

Claim.—"What I claim as my invention, is the manner of applying the instrument I have termed abdominal supporter and uterine restorer; namely, by making gradual pressure upon the uterus by means of the ring in the centre of the concaved end of the restorer armed with the silk cord, by which the pressure of the restorer is graduated. Further, the manner of changing the position of the restorer, by means of the hooks to which the silk cord is attached, on the external surface of the supporter, as set forth."

List of American Patents which issued in the month of August, 1843, *with Exemplifications, by* Charles M. Keller, *late Chief Examiner of Patents in the U. S. Patent Office.*

1. For an *Improvement in Water Wheels;* John Caldwell, Northfield, Franklin county, Massachusetts, August 4.

The patentee says,—"My invention consists in the combination of the reaction wheel and tub wheel; when the common reaction wheel is turning at the utmost velocity which any given power of water can impart to it, the water, after being thus used, falls powerfully from the apertures, having spent its entire force; when this reaction wheel is more or less loaded by the propelling machinery, its velocity is diminished and the water gushes with more or less force, (as the wheel is more or less retarded,) from the apertures made for its escape. It is to save this wasted force that my invention is applied."

Claim.—"What I claim as my invention, is the combination of the tub wheel and the reaction wheel, in the manner set forth."

2. For an *Improvement in Lard Lamps;* Henry Rose, Rushville, Schuyler county, Illinois, August 4.

The patentee says,—"The nature of my invention consists in adding a ventillator to the lamp for communicating with the chamber below the piston and projecting the end of the screw that elevates the piston above the wicks, so that it can be turned without moving the lamp, by which means the lamp is less liable to leak or get out of order."

Claim.—"What I claim as my invention, is, 1st, the projection on the screw above the wicks of the lamp, by which it can be turned, in combination with the lamp constructed and arranged as set forth. I also claim the tube combined with the movable piston lamp in the manner and for the purpose set forth."

3. For an *Improvement in Smut Machines;* Thomas Brown, Rome, Oneida county, New York, August 4.

Claim.—"What I claim as my invention, is the revolving cylinder with bearded or roughened beaters projected from the end of the cylinder, in the manner and for the purpose set forth; and also the arrangement of the spouts and trunks, in combination with the aforesaid case and cylinder."

4. For an *Improvement in Corn Shellers;* William Manning, South Trenton, Mercer county, New Jersey, August 4.

Claim.—"What I claim as my invention, is the application to corn shelling machines of cast or wrought iron plates, (with teeth on their edges,) let in flush with the top surface of the inclined floor, and secured thereon by screws, for the purpose of preventing corn from wedging between the wheel and floor, as set forth."

5. For an *Improvement in Winnowing Machines;* G. W. D. and Joseph Culp, Allenville, Switzerland county, Indiana county, August 4.

The patentees say,—"The nature of our invention consists in combining the shaking shoe with the wind wheel in such a way that all parts of the shoe shall have nearly the same motion, and the grain be acted on in the most effectual manner."

Claim.—"What we claim as our invention, is the combination of the shoe, constructed and suspended in the manner set forth, with the arrangement of the crank and pitman rod, as described."

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6. For an *Improvement in Mill-Saw Guides;* J. Norcross, Eastonton, Putnam county, Georgia, August 4.

Claim.—"What I claim as my invention, is the self-regulating guide, which fastens by a single pin in front of the saw, constructed and operating substantially as set forth."

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7. For an *Improvement in Stoves;* James Robb, Lewistown, Mifflin county, Pennsylvania, August 4.

Claim.—"What I claim as my invention, is, 1st, the arrangement of the door in front for cleaning the bottom flue. 2d. The plate for closing the space in the front plate, in front of the grate, and serving as a hearth plate and regulator."

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8. For an *Improvement in Vises;* J. J. Markham, assignee of E. G. Matthews, Worcester, Massachusetts, August 11.

Claim.—"I claim moving the jaw by the combination of an upper and lower screw connected and worked together by a link chain and cog wheels, and in combination therewith I claim the slide for guiding and keeping steady the movable jaw, as set forth."

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9. For an *Improvement in Shower Baths;* Nathaniel Waterman, Boston, Massachusetts, August 11.

Claim.—"I am aware that a portable pneumatic apparatus for shower baths, constructed with a chamber or vessel having a perforated bottom and a tube or opening at top, to be closed by the thumb, has been long known and used, and therefore I do not claim such an article; but I do claim the arrangement of the fixtures applied to such an apparatus by which the chamber thereof can be filled, raised above the head, and discharged by hand, as set forth, viz: in combining with the valve lever a finger rest applied to the side of the fountain near its top, and also a long rod, which shall extend from said lever nearly down to the bottom of the fountain, and there terminate in a ring, or other contrivance of like nature, as set forth."

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10. For an *Improvement in Cooking Stoves;* Joel Green, Rochester, Monroe county, New York, August 11.

Claim.—"What I claim as new, is the manner of forming and combining with the stove the two movable plates; the said plates being arranged as, and effecting the objects set forth. I also claim the manner of supporting the drop doors of the oven by the extension of the hearth, and the curved or depressed part which terminates it."

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11. For an *Improvement in Coffee Mills;* John Luther, Warren, Bristol county, Rhode Island, August 11.

The patentee says,—"The nature of my invention consists in constructing the mill of a flat shape, with an aperture at the top in the edge of the shell of the mill where the hopper is inserted, by which the grains to be ground, when put into the hopper, fall directly upon the top of the wheel, and the chamber into which the grains pass from the hopper is extended below and around the shaft, so that the whole space measured by the surface of the wheel may be filled with the grains which may be ground at the same time. I also use a gate in the hopper of the mill, which is raised and lowered by means of a screw, by which the feeding of the mill is regulated. In consequence of the flat shape of the mill, the grooves of the two parts of the mill do not come in contact, and wear upon each other."

Claim.—"What I claim as my invention, is the extending the chamber into which the grains pass from the hopper, below and around the shaft, whereby the grain is presented to a greater grinding surface, as set forth."

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12. For an *Improvement in Door Plates;* E. J. Lause, City of New York, August 11.

Claim.—"What I claim as my invention, is the combining of the transparent door plate with the ordinary metallic door plate; also the combination of levers and bolts to operate the slide, constructed in the manner set forth."

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13. For an *Improvement in the Machine for Forming Horse Shoes, Chain Links, &c.;* John F. Winslow and Thomas Osgood, Troy, Rensselaer county, New York, August 11.

Claim.—"What we claim as our invention, is the combination of the levers, constructed and arranged as set forth, with the former in the manner as set forth. We also claim in combination with the above the sliding frame having a cutter attached."

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14. For an *Improvement in Leaf Holders;* Joseph Nock, Washington City, District of Columbia, August 11.

Claim.—"I claim in combination the use of the square rods, carrying the points with the leather cover, by the intervention of the strips of metal, as set forth. In this claim I will observe, that the employment of the square rods, in combination with the other parts, is not a mere change of form, but is accompanied with the substantial advantages set forth. I claim, also, the manner of constructing and combining the lock with the within described apparatus; that is to say, I claim the arranging the spring catch, the bolt, and the other parts of the lock, in such manner that said bolt shall shoot into the holes in the middle nut, and shall otherwise be acted upon, and operate in the manner set forth."

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15. For an *Improvement in Winding Wire or Twine on Brooms;* William Beaman, Salem, Massachusetts, August 17.

Claim.—"What I claim as my invention, is the combination of the hollow shaft to receive the broom handle with the screw guide and wired roller or reel, governed by springs for receiving the wire, as set forth."

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16. For an *Improvement in Machinery for Making Various kinds of Twine and Small Cord;* Hugh McCubben, Petersburg, Virginia, August 17.

Claim.—"What I claim as new, is the combining together of the twisting, the intermediate traveling, and the back twist machines, so constructed as that they will pass over stationary stakes, as set forth. I also claim the manner of combining the sliding frame with the intermediate traveling frame, by which it is allowed to run in grooves from the back to the front of said frame. And these improvements I claim, whether the within described machine be made precisely in the form set forth or in any other producing the same effect."

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17. For an *Improvement in Locks for Safes, Bank Vaults, &c.;* William Hall, Chelsea, Suffolk county, Massachusetts, August 17.

Claim.—"What I claim as my invention, is constructing the levers or sliding plates with additional slots playing upon a fixed stud projecting through them and inserted in the lock case, and operating or throwing forward (with the bolt) one or more of the sliding plates by a corresponding number of bits of secondary or supplementary series of bits affixed to the key, and in connexion with those by which the remaining levers are elevated and actuated, as set forth; the whole being arranged substantially as set forth."

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18. For an *Improvement in Machines for Cutting Shingles, Veneers, &c.;* Robert A. Quartermas, Auburn, Oakland county, Michigan, August 17.

The patentee says,—"My improvement consists in the use of an apparatus in the table before each knife for regulating the throat of the knife, and the thickness of the article to be cut."

Claim.—"What I claim as my invention, is the manner in which I regulate the throat of the knives or cutters, and the thickness of the article to be cut, by means of an apparatus consisting of an angular plate and circular limbs, which are let into grooves in the table; the apparatus being held in place and adjusted by set screws connected with the plate and limbs, the latter serving as ways for sustaining the blocks; the whole being formed and operating substantially as set forth."

19. For an *Improvement in Evaporating Saccharine Juices;* Alfred Stillman, City of New York, August 17.

Claim.—"What I claim as my invention, is, 1st, the substituting any number of steam evaporators or clarifiers, constructed and operating as set forth, for any number of the ordinary train of coppers or kettles, to the effect that the steam boilers may be brought nearer to the strength of the fire from the train. 2d. The arrangement of the pipes passing through the liquid, in combination with the double bottoms, as set forth. 3d. The method of applying the exhaust steam from the engine; that is to say, by closing the exhaust pipe by means of a loaded valve, so as to maintain within it a pressure greater than that of the atmosphere, all as set forth."

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20. For an *Improvement in Ships' Cabooses;* James Wilson, City of New York, August 17.

Claim.—"What I claim as my invention, is the sectional guard of soap stone, clay, or any other substance attached or inserted in the fire plate, single or double, with one or more sections, as set forth. 2d. I use the double dovetail shutter or damper in combination to give more perfect direction to the fire round the entire surface of one or more ovens. 3d. I claim the employment of projecting flanches in the upper edges of the boiler, formed in the manner and for the purpose set forth."

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21. For an *Improvement in Cooking Stoves;* J. J. Anderson, Putnam, Muskingum county, Ohio, August 17.

The patentee says,—"My first improvement consists in the manner in which I combine a chamber of combustion, or fire place, for the burning of coal with a stove, the body or heated air chamber of which is in the ordinary form of those used for burning wood; and my second improvement consists in the dispensing entirely with all inside, back, or other division plates; the same plates which constitute the exterior of the stove serving to form the flue which leads to the elevated oven, and the whole interior of the stove. My chamber of combustion, or fire place, for containing the coal, consists of longitudinal trough-like depression, below the body of the heated chamber, and which is open at top, and is furnished with grate bars at its lower side, to admit the draught from the ash pit below it. I most commonly make my stove double; that is to say, with two fire chambers, one or both of which may be used as required. Both the fire chambers may be formed for the burning of coal, or one of them may be adapted to wood and the other to coal. When my second improvement alone is used, it may be applied to a stove in which wood is the only fuel used."

Claim.—"What I claim as my invention, is the combining with the stove furnished with flues leading to an elevated oven, or chamber of combustion for coal, consisting of a trough-like receptacle, depressed below the bottom plate of the heated air chamber, and extending along the whole width, or nearly the whole width, of the stove. I also claim the manner of forming the flues leading to an elevated oven, by a continuation of the top and bottom plates of the heated air chamber, or of the stove, when constructed for burning wood, and the consequent dispensing with all interior plates, in the manner set forth. I also claim the combining of the additional oven with the double stove, as set forth."

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22. For an *Improvement in Hanging House Bells;* Edward Stetson, Bedford, Bristol county, Massachusetts, August 17.

Claim.—"I claim the combination of a series of drawing wires, the carriage, the series of helical springs, that of the connecting wires, and the balance levers or other similar contrivances to which the number plate was hung; the whole being constructed and arranged as set forth, and for the purpose of depressing one or more of the number plates, and retracting the carriage after the same. Also, the combination with the balance levers of the vibrating plate, arranged and actuated by a movable carriage, and the mechanism connecting the two; the same being for the purpose of retaining the balance lever and number plate in their depressed position until another balance lever is operated, and then permitting the first lever to ascend while the other descends; all as described. Also, the combination with the series of depressing balance levers and number plates of a bell, whose hammer is actuated by the carriage, or other suitable mechanism; the whole being substantially as set forth."

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23. For an *Improvement in Soles of Boots and Shoes;* R. B. Ruggles, assignee of Walter Hunt, City of New York, August 17.

Claim.—"What I claim, is an improvement upon the French plan, or the plain plugs, as described, which improvement consists in preparing the soles, heels, &c., of boots and shoes previous to manufacturing the same into shoes, &c., by inserting in said soles, &c., in the manner set forth, metallic screw rivets, or plugs made from rods or wire, which is topped with a screw plate or dies, or otherwise stamped, cut, indented, or made, with spiral, diagonal, or transverse threads, grooves or indentations, in such manner as to hold more firmly when driven into said soles, by means of said screw, stamped, cut, or indented plugs or rivets; which improvement renders the soles, &c., thus prepared, more durable and useful, in consequence of their retaining the screw or indented plugs more firmly than the plain smooth plugs, and for which said improvement, in the combination of said screw, rivets and soles, prepared as set forth, I solicit letters patent."

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24. For an *Improvement in Machines for Printing;* Charles Thurber, Worcester, Worcester county, Massachusetts, August 26.

Claim.—"What I claim as my invention, is, 1st, the combination of the movable carriage and the platten with the wheel containing the type, substantially in the manner and for the purpose set forth. 2d. I claim the employment of the wheel having a set of keys around its periphery, on which are types for printing, constructed and arranged as set forth. 3d. I claim the employment of the ratchet wheel, pinion and rack, in combination with the keys and pawl for forcing forward the carriage; and also in combination therewith the lever for shortening the distance the carriage has to move. 4th. I claim the combination of the guide and wire with the keys for regulating their motion, as set forth. 5th. I claim the inking apparatus in combination with the wheel of types, arranged in the manner and for the purpose made known. 6th. I claim in combination with the above apparatus the employment of movable ways for elevating and depressing the carriage, substantially in the manner set forth."

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25. For an *Improvement in Portable Horse Powers;* Israel J. Richardson, City of New York, August 26.

Claim.—"What I claim as my invention, is placing the fly-wheel of a portable horse power in a frame separate from the horse power or machinery to be driven or propelled, and connected with the line shaft beyond the band wheel, as set forth."

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26. For an *Improvement in Making Salt;* Isaac Noyes, Kanawha Salines, Kanawha county, Virginia, August 26.

Claim.—"My claim is in the construction and application of a case or covering to the metallic pipes, with lids, sliding doors, openings, &c., therein, so as to pass the steam through the metallic pipes easily, and afterwards to distribute the heat to the brines in the cistern gradually, and preserve a temperature in the brines in the cistern to the degree adapted to the manufacture of coarse salt. It is for the use and application of the case or covering aforesaid in making coarse or alum salt with metallic pipes, a thing which has not hitherto been done successfully."

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27. For an *Improvement in Marking Boxes, &c.;* E. Wilson, assignee of J. C. Walker, Concord, New Hampshire, August 26.

Claim.—"I claim constructing the types of felt, or any other absorbing material of the same effective character, applied to a plate in the manner set forth. Also, curving the tablet (upon which they are composed or arranged for the purpose of printing,) longitudinally, or in other respects, substantially in the manner and for the purpose set forth. Also, the combination with the tablet of a box or magazine arranged upon it, in the manner set forth."

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28. For an *Improvement in the Manufacture of White Lead;* Smith Gardner, City of New York, August 26.

Claim.—"What I claim as new, is the introduction of carbonic acid, or of carbonic acid in mixture with a portion of atmospheric air, into closed vessels, in which fragments of metallic lead, in mixture with litharge or protoxide of lead, in equal or varying proportions, are subjected to long continued attrition in water, for the purpose and in the manner set forth."

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29. For an *Improvement in Clocks;* Charles Kirk, Bristol, Hartford county, Connecticut. August 26.

The patentee says,—"My first improvement consists in the forming of boxes or barrels, which are to contain the springs, by casting them in one piece with the pillar plate, by means of which device a large amount of labor is saved, as these parts of the instrument may be thereby manufactured at one-fourth the usual cost. My second improvement consists in a new and simple construction and arrangement of the apparatus which constitutes the striking part of the clock."

Claim.—"What I claim as new, is the manner of forming the pillar plate and the barrels or boxes for containing the springs of one single piece of cast metal. I claim, also, the manner of forming and combining the lift piece, the click, the wheel, and their appendages, arranged and operating in the manner set forth, for the purpose of governing the striking part of the clock."

30. For an *Improvement in Straw Cutters;* John K. Landis, East Hempfield, Lancaster county, Pennsylvania, August 26.

Claim.—"What I claim as new, is the manner in which I have combined and arranged the cam, the lever, and the feeding apron, with the trough for holding the straw in the machine."

31. For an *Improvement in Machines for Forging, Drawing, Swedging, or Forming Spindles, Rollers, Bolts, and Various other Articles in Metal;* John Miller and E. M. Dorr, Clapville, Worcester county, Massachusetts, (assignees of William Ryder, Great Britain,) August 26.

Claim.—"We claim as our invention, the improved apparatus for forging, drawing, moulding, or forming spindles, rollers, and various other like articles in metal, as set forth; that is to say, we claim the manner of combining the eccentric cam, or crank, with the cradle piece, the top and bottom punch bars or swage holders, and with their swages, the hammers being provided with a spring, for the purpose of lifting or keeping up the punch or cradle piece against the eccentric. I also claim the employment of elastic substance, for the purpose and in the manner set forth. I also claim the combining with such a machine the apparatus for raising and lowering the anvils; and these devices I claim as applied to these purposes in whatever manner the construction, form or dimensions of the apparatus may be modified or varied, whilst the same ends are attained by means substantially the same."

32. For an *Improvement in Tailors' Marking Pencils;* W. Coover, Erie, Pennsylvania, August 26.

Claim.—"I claim the mode described of constructing a marking pencil for tailors; that is to say, combining with a flat tube the screw stem with its follower, in the manner and for the purpose set forth."

33. For an *Improvement in Sugar Works;* Robert Rillieux, New Orleans, Louisiana, (assigned to Samuel V. Merrick and John H. Towne,) August 26.

Claim.—"What I claim as my invention, is the employment of a weighted throttle, or other regulating valve, in the main steam pipe leading from the boiler to the evaporating pan or pans, and the steam engine, which valve shall be situated between the induction valve of the engine and the evaporating pan or pans, for the purpose and in the manner set forth. I claim a vacuum pan, or pans; that is to say, an evaporating pan, or pans, connected with a condenser, in combination with an evaporating pan, or pans, or boiler, in which the saccharine juice, or other fluid, is evaporated under a pressure, lower, equal to, or greater than, the atmosphere, which last mentioned pan, or pans, or boiler, prepares the saccharine juice, &c., from the vacuum pan, or, pans, and at the same time supplies the necessary vapor from the saccharine juice, &c., to complete the evaporation or concentration of the syrup, &c., in the vacuum pan or pans, as set forth. I claim surrounding the evaporating column, known as the champonoise column, with an outer column or jacket. I claim the employment of a differential thermometer to regulate the concentration of the syrup, in the manner set forth; and I also claim the so constructing the differential thermometer that all the range of its action up to the point desired shall not act on the regulating valve, as set forth."

List of American Patents which issued in the Month of September, 1843, *with Exemplifications by* Charles M. Keller, *late Chief Examiner in the U. S. Patent Office.*

1. For an *Improvement in Piano Fortes;* Jones Chickering, Boston, Massachusetts, September 1.

Claim.—"What I claim as my invention, is supporting the strings through a solid ledge cast directly upon the lower part of the inclined wire front plate, through suitable apertures of which (ledge) the strings are to be passed in the manner set forth; the tone of the high notes being thereby not only greatly improved, but rendered more durable. I also claim the mode of counteracting the strain of the wires on certain parts of the iron frame, and thereby preventing vibration of such parts and accents to the tone; or in other words, my peculiar method of constructing the metallic frame of a grand piano, by casting the same with a series of bars, in combination with an inclined front plate and vertical ledge and curved side plate, substantially as set forth."

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2. For an *Improvement in Hot-Air Stoves;* Moses Pond, Boston, Massachusetts, September 1.

Claim.—"What I claim as my invention, is the combination of the chamber of combustion, the interior concentric cold air space immediately surrounding the said chamber, the concentric flue or smoke space encircling the said cold air space, and the interior concentric cold air space which surrounds the flue space; the whole being arranged and operating as set forth. Also, the particular method set forth of causing the smoke and gases to be retained and to circulate within the flue space, by the horizontal plate in combination with the vertical partitions immediately over and under said plate; the same being substantially as set forth. Also, the combination of the chamber of combustion, the interior concentric cold air space immediately surrounding the said chamber, and the concentric flue or smoke space encircling the said cold air space."

3. For an *Improvement in Hydrants;* S. C. Higbie, Oppenheim, Fulton county, New York, September 1.

The patentee says,—"The nature of my invention consists in fitting a tubular valve into the hydrant, having two series of holes in it, with a spring to close the lower ones. The lower set communicates with the water pipe, the other with the leak; and connecting therewith a vacuum chamber to receive the water from the eduction pipe and prevent its freezing up, which vacuum chamber can also be made to act and close the induction valve."

Claim.—"What I claim as my invention, is the tubular valve having two rows of holes arranged in it, one above the other, and a packed valve attached to the end, constructed and arranged as set forth, in combination with the chamber and piston, by means of which the valve is raised, and which forms a reservoir for the water in the pipe when the supply is cut off. 3d. I claim the combination of the air chamber with the hydrant, constructed and combined in the manner set forth."

4. For an *Improvement in Pistons and Slide Valves of Horizontal Steam Engines;* Benjamin H. Brown, Philadelphia, Pennsylvania, September 1.

The patentee says,—"The nature of my invention consists in extending the packing on the piston over as much of the surface of the rim of the followers on the top, as the pressure of the steam, if allowed to act upon that surface, would equal the weight of the piston. And in fitting in my slide valve, a cap packed steam-tight on the balance, which cap being pressed upwards by the force of the steam upon the rim of the cap keeps it tight against the top of the steam chest."

Claim.—"What I claim as my invention, is the applying the steam in the cylinders of horizontal steam engines to raise or counteract the weight of the piston by packing off more of the top surface of the piston than the bottom, which I style the self-counterpoised piston: and a self-adjusting cap in balance slide valves, which being fitted and packed steam-tight over the balance, is kept against the steam chest by the pressure of the steam, in the steam chest, on the rim of the cap, or by a spring between the top of the balance and the inner surface of the cap, thereby compensating for the wearing away by friction, and the contraction and expansion of the metals, and preventing the steam from acting on the top of the cap and destroying the balance, which I style a movable self-adjusting cap."

5. For an *Improvement in Cooking and Air Heating Stoves;* Benjamin Shepard, Boston, Massachusetts, September 1.

The patentee says,—"My improvements consist in a certain peculiar arrangement of the chamber in which cold air is introduced to be warmed, and from thence conducted to different apartments; and also in the arrangement of the air and smoke flues surrounding the oven; the stove being in its character similar to that for which letters patent were granted to me on the thirteenth day of May, eighteen hundred and forty-two."

Claim.—"What I claim as my invention, is the combination with the furnace or fire place and its flues, of the side passages, the end passage, and the air chamber extending over the furnace, the whole arranged as set forth. Also, placing the hot-air chamber (which is combined with the flue space) directly between a fire place, or grate, or boiling chamber, or flue space over the said hot-air chamber, and flues passing in direct contact with the sides of the air chamber, in the manner and for the purposes set forth. Also, the peculiar arrangement of the entrance and exit air and smoke pipes, of the spaces surrounding the oven, by which arrangement the paths of the air and smoke are caused to pass by or cross each other, as set forth, viz: placing the entrance air pipe between the entrance smoke pipes, in connexion with the peculiar method of arranging the discharge air pipes on each side of the discharging smoke pipe; the whole being substantially as set forth."

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6. For an *Improvement in the Construction of Tubular Boilers for Generating Steam;* C. W. Bentley, Baltimore, Maryland, September 1.

The patentee says,—"The nature of my invention consists in combining wrought iron tubes and case with a furnace and cast iron heads, so as to make a cheap and efficient tubular boiler."

Claim.—"What I claim as my invention, is casting the heads on to the wrought iron tubes in combination with the method of attaching the external casing or boiler to the heads by shrinking the same thereon, in the manner set forth."

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7. For an *Improvement in Lard Lamps;* Harvey Tomlinson, Geneva, Ontario county, New York, September 1.

The patentee says,—"My improvement consists in the manner in which I attach a glass chimney or burner thereto, and raise and depress the same, and in the manner in which I regulate the draught that passes through a central tube to supply air to the interior of the hollow wick."

Claim —"What I claim as my invention, is the manner of regulating the draught thereof by the combined operation of the ventilating ring, or ferule, and the shifting chimney or burner; the respective parts being so formed and arranged as to operate in the manner made known."

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8. For an *Improvement in Fire Ladders;* Morton B. Hill, Fairfield, Greene county, Ohio, September 1.

Claim.—"What I claim as my invention, is the combination and arrangement of the machine for preserving life and property in case of fire; that is to say, I claim the combination of the pole, wheels, pullies, rope or chain ring, with the suspended chain, in the manner and for the purposes set forth."

9. For an *Improvement in Bee Hives;* William D. Miller, Red River, Clark county, Ohio, September 1.

Claim.—"What I claim as my invention, is the combination of the protector and slide, constructed as set forth, with the arrangement of hives furnished with pyramidal bottoms."

10. For an *Improvement in Seed Planters;* G. Mottmiller, Columbus, Franklin county, Ohio, September 1.

The patentee says,—"The nature of my invention consists in constructing a machine that will drop seed at regular intervals at any distance apart required, and combining therewith shares to open the ground and cover the seed after planting; the frame of the said machine being convertible to other purposes when required."

Claim.—"What I claim as my invention, is, the combination of the double hopper and wheel, so arranged that the one wheel drops two rows, constructed and adjusted in the manner and for the purpose set forth. I also claim the frame jointed to the carriage axle, combined and arranged as set forth.

11. For an *Improvement in the Representation of Tides and Currents;* B. F. Watts, Fort Gaines, Early county, Georgia, September 1.

Claim.—"What I claim as my invention, is the method of illustrating the phenomenon of the tides and the currents of the ocean and the heaping up of the waters on the east and reducing them on the west side of all the continents, by means of rotating wheels or troughs having the elevations of the land constructed on the plain surface, and the depressions of oceans, seas, &c., hollowed out to contain water, so that by the rotation of these the course of the tides and the currents of the ocean and heaping up of the waters, &c., will be represented."

12. For an *Improvement in Extension Tables;* Cornelius Briggs, Roxbury, Norfolk county, Massachusetts, September 1.

Claim.—"I claim the supporting leg firmly and permanently attached to the centre joint of the extension frame work, by means of the pin passing through both plates of said joint, and driven vertically into said leg; and the combination of said leg so arranged with the semicircular grooves or channels in the two halves of the upright parts of the standard frame, the leg serving as a sufficient support for the extension part of the table, and the grooves entirely encasing the leg when the table is closed; the whole being substantially as set forth.

"I also claim the spring latches or catches, arranged as set forth, for holding the two main halves of the table together when the table is closed, and the combination with said catches of the lever bar, with its horizontal arm and vertical rod, for unfastening said catches when it is desired to extend the table, as set forth.

"I also claim the combination of a pulley, with its ratchet wheel, pall, cord, &c., arranged together as herein described with the extension frame work, leaves, &c., and with the two main or semi-circular halves of the table, the whole being constructed, arranged, and operating substantially as set forth."

13. For an *Improvement in Condensing Cotton Rovings, &c., for Spinning;* Jacob Graves, New Ipswich, Hillsborough county, New Hampshire, September 1.

Claim.—"What I claim as my invention, is the particular method of preparing the cotton for spinning, by subjecting the same, as it proceeds from the carding engine, to the action of a series of drawing rollers, rounding or guiding tubes, and grooved and tongued condensing rollers, in combination with each other. And I claim the combination of the series of drawing rollers, the twisting or rounding tubes, and the grooved and tongued condensing rollers, the whole being arranged and operating as set forth."

14. For an *Improvement in Straw Cutters;* Samuel P. Ross, Lewisburg, Union county, Pennsylvania, September 1.

Claim.—"What I claim as new, is the manner in which I have combined and arranged the principal or crank shaft, the ratchet wheels on the gudgeons of the two feeding rollers, the vibrating bars, and the changeable cams working within the openings in said bars; the respective parts cooperating in producing the desired result, but only in their combination and general arrangement with each other as set forth."

15. For an *Improvement in Cutting Veneers;* William Foster, City of New York, September 1.

The patentee says,—"The nature of my invention consists in the method of bracing and regulating the bed plate and knife, and combining therewith the apparatus for straightening the wood as it is cut."

Claim.—"What I claim as my invention, is the adjustable segment piece, in combination with the wheel and knife, in the manner set forth. I also claim, in combination with the adjustable gauge plate, the projecting concave guide attached thereto, for straightening the wood after it is cut, and, in combination therewith, the roller, in the manner and for the purposes set forth."

16. For an *Improvement in Fountain Pens;* Nelson Bartlett, Canajoharie, Montgomery county, New York, September 9.

The patentee says,—"The nature of my invention consists in forming a fountain in the pen holder, that will supply the pen through a narrow tube at the bottom, the ink in said fountain being forced out by a piston, and the pen having a recess in the holder, within which it can be drawn, so as to make the whole apparatus portable."

Claim.—"What I claim as my invention, is the combination of the fountain, having a piston working up and down in it, with the movable pen, in the manner and for the purpose set forth."

17. For an *Improvement in Freezers for Making Artificial Ice;* Nancy M. Johnson, Philadelphia, Pennsylvania, September 9.

Claim.—"What I claim as new, is the revolving curved beater, with its vertical axis, in combination with a freezing apparatus, as set forth."

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18. For an *Improvement in Attaching Hoes to Handles;* O. Clark and W. D. Hillis, Hudson, Summit county, Ohio, September 9.

Claim.—"What we claim as our invention, is the mode of securing the fork, hoe, &c., to the ferule, by means of the shoulder or offset and wedge, and the mode of fastening the fork, hoe, &c., to the ferule, by means of the notch and wedge, in combination with the mode of fastening the ferule to the handle, by means of driving in with the ferule, after the fork, hoe, &c., is secured to the ferule, and by the shank of the fork, hoe, &c., splitting the wood or handle, or answering what might be termed the purpose of a notch wedge, secures the handle to the ferule."

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19. For an *Improvement in Distilling Alcohol;* John T. Heard, Boston, Suffolk county, Massachusetts, September 9.

Claim.—"What I claim, consists in the peculiar manner of arranging the receivers with respect to the alembic and each other: that is to say, in placing the said receivers at different altitudes in regard to each other, in combination with the particular manner of connecting them with the alembic and with each other; the whole being substantially as set forth, and for the purpose of retaining the condensed spirituous or alcoholic vapors of different degrees of strength, and preventing their return into the still. I also claim the combination, with a series of receivers arranged as set forth, of a coiled pipe and water bath or condensing apparatus, having its coils connected with the different receivers, as set forth. Also, the peculiar arrangement of the several pipes which connect the said condensing apparatus and receivers, viz., connecting the lower part of the end of the first coil of the pipe with the first or lower receiver, and that of the second coil with the second or middle receiver, and that of the last coil with the upper receiver; the whole being constructed and operating substantially as set forth."

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20. For an *Improvement in Machinery for Distributing and Setting up Type;* Frederick Rosenborg, Kingdom of Sweden, September 9; (in England, November 27, 1840.)

Claim.—"I claim the peculiar arrangement of mechanism, or combination of parts, constituting a machine for performing the operation called distributing the types, which we call arranging.

"2d, I claim the use of the grooved plates in which the types are arranged in rows or columns.

"3d, I claim the method of lowering the types, line by line, from the galley into the traveling carriage.

"4th, I claim the use of a traveling or sliding carriage, by means of which each type is consecutively brought over the proper opening through which it descends in its groove in the grooved plate.

"5th, I claim the use of the indented rib, in combination with those parts of the sliding carriage which form a recess of the proper width to suit the thickness of the type, and into which the type is pushed, as set forth.

"6th, I claim the manner of arranging and combining the bent levers or keys, whereby the sliding carriage is stopped over the proper aperture, through which the type is to descend, and which keys at the same time act upon the pusher of the carriage, and thereby force the last type out of the line into the recess which is formed of the proper width by the indented rib acting upon a spring lever connected to the sliding carriage, and which regulates the width of the recess.

"7th, I claim the method of forcing the types along the grooves of the grooved plate, by means of the shaft and a series of cams and eccentrics, whether these cams are used by themselves or in conjunction with levers or pushers for this purpose.

"8th, I claim arranging the types in vertical columns in a rack frame, constructed as set forth, on one or both sides of a groove passage or way, into or on to which groove passage or way the several types are (as they are required) pushed out, by any convenient mechanical arrangement, from the vertical columns in which they are arranged, and then conveyed to the receiver, either by means of an endless band or chain, or by any other contrivance substantially the same in its construction and operation.

"9th, I claim the employment, in combination with the lever and tube, of an endless band or chain, on to which the types are deposited to be conveyed to the receiver, whether the said band or chain, lever, and tube, are used in combination with the other mechanical arrangements, or with any other in which it is employed for a like purpose.

"10th, I claim the manner of pushing out one single type from any column in the rack frame, by means of pushers, which are acted upon by levers in connexion with the keys, so that when any key is depressed, it may, by any mechanical contrivance, push forward the corresponding pusher, and thereby force out the type from the column on to the endless band, which runs in a longitudinal groove at the back of the column of type, by which means the type is conveyed to one end of the machine, where it is deposited in the receiver in the manner set forth.

"11th, I claim the peculiar construction and arrangement of the parts immediately connected with the receiver, into which the types are severally brought by the endless belt, these parts consisting of the carrier pulley, the roller with their appendages, and the T-formed belt-slider upon which the types are built up in lines, and the mechanism connected with the said slider.

"12th, I claim the manner of forcing or pushing the types down in the line formed on the slider, after they are brought to the receiver by the endless belt or chain. I claim this, whether it is effected by means of the small endless chain or belt, in conjunction with the pulley round which the chain passes, or by means of a small cam or other eccentric, and whether the said cam or eccentric acts directly on the type or through the medium of a lever or pusher.

"13th, I claim the construction and arrangement of the justifying stick, and also the mode of removing the line out of the receiver into the same, by means of which justifying stick the line is lowered into the galley. I also claim the manner in which the said galley is fixed in the machine.

"Lastly, I claim that part of the machine called the counting apparatus, as annexed to, and combined with, the setting-up machine, whereby the compositor is enabled to ascertain how far the line in the receiver has approached towards completion."

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21. For an *Improvement in Winnowing Machines;* James Starr, New Lisbon, Columbiana county, Ohio, September 9.

Claim.—"What I claim as my invention, is the construction and use of the rake with the vibrating screens and hopper, in the manner set forth."

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22. For an *Improvement in Ploughs;* William Black, Scott county, Illinois, September 14.

Claim.—"What I claim as my invention, is making the mould-board adjustable, in the manner and for the purpose set forth, by which means the wing is made adjustable, or susceptible of being slid down on a curved line, and made fast to any given point of the whole distance it is allowed to be moved. The purpose designed to be effected is this: that the wing of the plough may be conveniently slid down whenever the wear of the edge may require, in order that the edge may be kept level with the bottom of the bar."

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23. For an *Improvement in the Machine for Manufactaring Horse Shoes;* Henry Burden, Troy, Rensselaer county, New York, September 14.

Claim.—"What I claim as my invention, is, 1st, the manner of combining and arranging the cutters and gripping dies in the said machine, so that the former be in the same plane with the latter, thereby allowing the bar of iron to be passed directly in between them.

"2d, I claim the causing of the peripheries of the segment dies to travel faster than the sliding frame and the gripping dies, as set forth.

"3d, I claim the manner of combining the segment dies, for drawing out and distributing the metal, with those for grooving and punching it, so that the piece of metal shall be carried directly from the former to the latter, by a continued movement of the sliding frame. And for a full description of those parts of the said machine which it has not been thought necessary to present, I refer to the original patent."

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24. For an *Improvement in Lamps;* Samuel Rust, City of New York, September 14.

The patentee says,—"This improvement consists of a piece of metal as a spring or heater, about $\frac{5}{8}$ths of an inch wide, more or less, tubular or otherwise, soldered or fastened to the tube, or inside of the stopper, which spring or heater I extend downwards to the bottom part of the bowl of the lamp, or as far down as is necessary for the length of wick, and then bend it upwards and carry it through the tube or top of the stopper, so as to run a hollow wick on to it the same as in the Argand lamp, or to put the wick in all on one side, at the pleasure of the user."

Claim.—"What I claim as my invention, is the piece of metal, spring, or heater, as applied into the tube, soldered or fastened into the tube, stopper, or lamp, and combined with the tube, stopper, or lamp, in such a way and in such manner as set forth, or in any way essentially the same, and so combined with the roller as to act in any way on the roller or wick as a spring, either in the tube or at the bottom of the short tube or socket, pressing against the roller or wick, for the purpose of receiving a thick wick or a thin wick."

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25. For an *Improvement in the Manner of Stiffening Circular Saws;* Elijah Pratt, Washington county, New York, September 14.

Claim.—"What I claim as my invention, is the method of stiffening circular saws, by making them of two separate plates fastened substantially as set forth."

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26. For an *Improvement in Apparatus for Reducing Dislocations;* Geo. O. Jarvis, Portland, Middlesex county, Connecticut, September 14.

Claim.—"What I claim as my invention, is the application of the lever to the purposes set forth, and the combination of the lever with the ratch wheel and catch, and the screw and rack, in the manner and for the purpose set forth."

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27. For an *Improvement in the Method of Ascertaining the Centre of Gravity of a Vessel, its Best Sailing Trim under Various Depths, &c.;* John Hobday, Portsmouth, Norfolk county, Virginia, September 14.

Claim.—"What I claim as my invention, is the application of the process set forth to the construction of models, lading vessels, and finding and preserving the true sailing trim of vessels at any draft of water; also finding the true centre of displacement or centre of gravity."

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28. For an *Improvement in Steam Boiler Furnaces;* Gideon Shyock and Samuel Underwood, Louisville, Kentucky, September 14.

Claim.—"What we claim as our invention, is the using, in the manner set forth, fire brick (or any other material which is a non-conductor of heat) in the construction of furnaces for the evaporation or distillation of liquids, and under and about the boilers, and in the flues of boilers, for steam engines."

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29. For an *Improvement in Ploughs;* J. S. Eastman, assignee of George Cleasy, Baltimore, Maryland, September 14.

The patentee says,—"The nature of my invention consists in forming a self-sharpening point, and inserting it in the landside, the front lower edge of which is formed by the share, both of them being fastened by the same bolt."

Claim.—"What I claim as my invention, is the combination of the point and mould-board, constructed and arranged in the manner set forth, the share and mould forming the socket in which the point is held."

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30. For an *Improvement in the Machine for Washing Gold;* Henry Bourne, Elberton, Elbert county, Georgia, September 14.

The patentee says,—"The nature of my invention consists in cutting in the screen which covers the leading trough, transverse slits, at certain intervals between which the screen is perforated with holes in the usual way, and in furnishing the bowl with a runner composed of horizontal cross arms, from which project downwards vertical teeth, for stirring the gold, sand, &c."

Claim.—"What I claim as my invention, is the employment of the runner, constructed as set forth, in combination with the bowl, constructed and arranged as set forth. I also claim constructing the screen in the manner set forth, so that any particles of gold that pass down between the holes shall be caught at the slits which are formed for that purpose."

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31. For an *Improvement in the Machine for Cleaning and Polishing Knives and Forks;* Martin N. Armstrong, City of New York, September 14.

Claim.—"What I claim as my invention, is attaching the brushes to separate arbers, (thus dispensing with a shaft,) one of said arbers being provided with a set screw, or other analogous device, so that the brushes can be brought nearer to, or set further from, each other, for the purpose and in the manner set forth."

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32. For an *Improvement in Cotton and Wool Cleaners;* Theo. Ely, City of New York, September 14.

Claim.—"I claim as my invention, 1st, the combination and arrangement of the several parts, to wit: the endless cloth, feeding roller, main cylinder, having movable combs or teeth; the apparatus for removing the burrs or seeds, consisting of the plates with their appendages; the drawing roller and cleaning apparatus; together with the gearing, eccentric plates, and grooves, necessary to give the desired motions to the parts, forming a machine for removing the burrs from wool and seeds from cotton. And this I claim, whether the several parts are placed relatively to each other, or in any other manner substantially the same.

"2d, I claim the movable combs, whether actuated as set forth, or in any other way which will give them an alternate motion in and out of the cylinder.

"3d, I claim the apparatus for removing the burrs or seeds, consisting of the fixed plate and the sleding plate, whether the latter be attached as set forth, or by any other means which will give a like motion."

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33. For an *Improvement in Portable Screw Presses;* Alexander Hallam, New Orleans, Louisiana, September 14.

The patentee says,—"The nature of my invention consists in connecting with a screw and cross-head, four or more, or less, can-hooks, by means of rods or chains, so that the screw may be made to act on the upper head of the cask by applying the can-hooks to the bottom chine, which can be done without moving it from the skids on which it rests in the warehouse."

Claim.—"What I claim as my invention, is the combination of can-hooks with a screw and cross head, constructed and arranged as set forth."

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34. For an *Improvement in Water Wheels;* Daniel Stearns, Rome, Oneida county, New York, September 14.

Claim.—"What I claim as my invention, is the wheel with three or more buckets, each presenting three inclined sides, constructed and arranged as set forth, to the action of the water, the sectional shape of said buckets being either square, oblong, oval, elliptical, or otherwise, so as that the principle remains the same."

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35. For an *Improvement in Crystalizing Salt;* Beriah Douglass, Albany, New York, September 23.

The patentee says,—"The nature of my invention consists in the formation and arrangement of furnaces and flues in a boiler, by which salt is more perfectly and profitably made, and steam is generated for propelling and other purposes at less expense than by any other means."

Claim.—"What I claim as my invention, is the manner of precipitating and crystalizing salt in the briny water below the heating furnaces and flues, by which means the salt is better made than by any mode of boiling in kettles or troughs over the fire, as is usually done. I also claim the mode of arranging furnaces and flues open on both sides of the boiler, for the purposes mentioned, the flues being wide and thin, standing vertical, and thus combined with the furnaces and plank boiler."

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36. For an *Improvement in Cooking Stoves;* Samuel B. Sexton, Baltimore, Maryland, September 23.

The patentee says,—"This stove resembles, exteriorly, my patented stove. The improvements are principally in the addition of the rotary top, side flues, central flue or pipe, and side pipe to be used in the summer. Also, in the manner of making the rotary oven in segments."

Claim.—"What I claim as my invention, is, 1st, the combination of the rotary top with the revolving oven, in the manner set forth. 2d, The arrangement of the central vertical pipe, over which the rotary top turns, and through which the draught is conducted, as set forth. 3d, The arrangement of the horizontal pipe as set forth."

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37. For an *Improvement in the Method of Coupling the Forward Axletree of a Four-Wheeled Carriage with the Reach and Head Block or Rocker;* Alex. H. Hart, Chagrin Falls, Cuyahoga county, Ohio, September 23.

The patentee says,—"The nature of my invention consists in an improved method of uniting the lower or rotating plate of a compound coupling joint with the axletree, by means of a hinge joint, so constructed as to give strength and durability to the whole, as well as to allow the axletree both a horizontal and a limited vertical motion; my invention being an improvement upon the method of uniting these patented to Alfred Osgood."

Claim.—"What I claim as my invention, is the method in which I construct the joint which unites these two: that is to say, I claim the semicircular knuckle with its projection and gudgeons, and the concave on the lower plate, in combination with the bed and the side plates, that receive the gudgeons and projections for the concaves to rest on, as set forth."

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38. For an *Improvement in the Machine for Knitting Stockings;* Henry Burt, Boston, Suffolk county, Massachusetts, September 23.

Claim.—"What I claim as my invention, is the mechanism for narrowing and widening, consisting of the movable stops, combined with a rack of teeth or other suitable contrivance, formed upon the shifting bar, and acting upon the carriage of the yarn-guide, as set forth; or of a pattern cylinder, combined with the shifting bar and the carriage, and operating therewith as set forth. Also the stop rack, combined with the tube of the yarn-guide, and actuated in the manner set forth. Also the mechanism which effects the changes of the clutches, the same consisting of the shifting bar, the arber, having a circular depression and radial recesses in its heads and levers, and other parts connected to the same, and connecting the same with the clutches; the whole being arranged and operating as set forth. Also the stationary roller, and the projections and their interweaving curve, (formed upon the shifting bar,) in combination with the spring of the sliding toggle bars; and also in combination with the rail and its depressions; the whole being for the object set forth. Also the cloth bar, arranged and operating as set forth. Also the particular method by which the depressing bar is carried and forced down upon the pointed ends of the needles, in order to press them into the grooves in their shanks, viz., by a combination of bent levers and arms, the same being actuated substantially as set forth. Also the manner of raising the stitch hooks, viz., by an elevating plate through which they extend, and which is combined with and operates them, as set forth. Also the method of clearing the point or lower end of the yarn-guide from the depressing bar, when the latter descends upon the needles, viz., by a ledge in the latter, in combination with a roller applied to the T-piece of the yarn-guide, the whole being as set forth. Also the method of clearing the point of the yarn-guide from the stitch hooks when the roll passes by the thread-guide, or as soon as the lateral motion of the thread-guide is stopped, viz., by the beveled edge plate, (applied to the cross piece,) in combination with the screw, or other contrivance of similar character, projecting from the T-piece of the yarn-guide. Also the mode of regulating or adjusting the distance to which the points of the needles shall retreat, viz., by the movable curved pieces, making part of the cam, the same being arranged and operating substantially as set forth. Also the combination with the mechanism, (the arm and shaft supported by pivots,) which sustains and carries the roller of the depressing and elevating bar, raised and depressed by machinery, substantially as set forth."

39. For an *Improvement in the Machine for Immersing Carriage Wheels in Water after putting on the Hoop or Tire;* James Morris, Bloomfield, Essex county, New Jersey, September 23.

Claim.—"What I claim as my invention, is placing the frame, with the wheel thereon, in a box or vessel filled with water, and lowering it so as to immerse the wheel in the water, as set forth, using for that purpose any of the methods described, or any other mechanical contrivance which will produce the same effect."

40. For an *Improvement in Tuyeres;* Lewis E. Clow, Montpelier, Washington county, Vermont, September 23.

Claim.—"What I claim as my invention, is the combination of the revolving tuyere cap, constructed as described, with the central under-blast, arranged and constructed as described."

41. For an *Improvement in Railroad Car Springs;* James Millholland, Baltimore, Maryland, September 23.

Claim.—"What I claim as my invention, is the combining with the cars of a spring on each side, formed of wood or of metal, extending along over all the bearings of the axles, having bearing blocks between each of the wheels, and being received within pockets at their ends as set forth, the whole being combined and operating substantially as set forth."

42. For an *Improvement in Water Wheels;* Abraham Baker, Dalton, Wayne county, Ohio, September 23.

The patentee says,—"The nature of my invention consists in forming an inclined wheel with movable buckets in the rim so as to receive the water at its highest point and discharge it at its lowest, by which I am enabled to use a wheel of a much larger diameter in a given fall than can be done with an overshot wheel."

Claim.—"What I claim as my invention, is the combination of the buckets constructed and operated as described, in the manner and for the purpose substantially as described."

43. For an *Improvement in the Apparatus for Closing Doors, Gates, &c.;* Gardner Barton, Jr., Waterford, Saratoga county, New York, September 23.

Claim.—"What I claim as my invention, is the combination and arrangement of the wheels, the lever, weight, arm, and door or gate, operating in the manner and for the purposes set forth."

44. For an *Improvement in Making Paper Buttons;* Elisha M. Pomeroy, Wallingford, New Haven county, Connecticut, September 23.

The patentee says,—"The nature of my improvements consists in preparing the button to receive a smooth coat of varnish or the finishing lustre, and also in securing that lustre to the button in the highest degree and by the most economical method."

Claim.—"What I claim as my invention as a new and useful improvement, is the process by which the button, after its roughness is removed, is prepared to receive a smooth coat of varnish, and which consists in revolving the buttons in a cylinder with so much japan varnish, or some of the fixed oils, as they will receive without adhering to each other, and until they present a dry and polished surface, after which they are baked.

"And I also claim the mode of giving to the button when prepared by the last named process a smooth coat of varnish or the finishing lustre, which said mode consists in revolving the buttons in a cylinder with so much japan or other varnish as they will receive upon their surface, and until all have received a light coating of the varnish, at which time, and before they have lost their lustre, they are again removed to the kiln and baked until dry, when they are finished and prepared for packing."

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45. For an *Improvement in Vegetable Elixir for the Cure of Bronchitis, &c.;* Peter Faulkner, Rockville, Crawford county, Pennsylvania, September 23.

The patentee says,—"Take two pounds of sweet apple tree bark, dried, and boil the same in six gallons of soft watar till reduced to one gallon, then strain it. Add two and an half ounces of tartarized antimony dissolved in a quart of warm water; four ounces of pulverized jalap; half pound of nitrate of pottass; one pint spirits of camphor, and a half pound of loaf sugar; the whole to be well mixed together and bottled for use."

Claim.—"What I claim as my discovery, is the before described medicine for curing the bronchitis, sore throat, asthma, croup, whooping cough, and dyspepsia."

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46. For an *Improvement in Grist Mills;* Josiah Platt, Weston, Fairfield county, Connecticut, September 28.

Claim.—"What I claim as my invention, is the manner of suspending the runner to the screw by means of the connecting bolt, shoulders, and screw, and of raising and lowering the runner, as set forth."

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47. For an *Improvement in Medicated Vapour Baths;* Morris Mattison, Boston, Suffolk county, Massachusetts, September 28.

Claim.—"What I claim as my invention, is the particular method of constructing and rendering portable the frame of the bathing tent, by forming it of a folding bottom or box in combination with jointed posts and top rails, or other similar contrivances, the whole as set forth. Also, the mode of sustaining the top and preventing in a great degree the destruction of a wick of a spirit lamp by the flame, and also permitting the flame to have access to a great extent of the vertical surface of the wick, viz: by inserting within the said upper part a metallic ring supported on the top of the elevating tube of the wick, the whole being as set forth."

48. For an *Improvement in Endless Chain Paddles for Propelling Vessels;* Beriah Douglas, Albany, New York, September 28.

Claim.—"I am aware that endless chain paddles have been so arranged as to cause the paddles to leave the water on an inclined plane to avoid the usual wasting of power, this being effected by two drums of different diameters; and therefore it will be understood that I do not claim this as my invention; but as I am enabled by my arrangement to cause the paddles to enter as well as leave the water on an inclined plane, I claim as my invention the method of effecting this by having the chains pass around three or more drums, the inner drum or drums being ranged lower than the end drums or wheels, in the manner set forth."

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49. For an *Improvement in Tailors' Measures;* George Eckler and S. X. Ball, Flint Creek, Ontario county, New York, September 28.

The patentees say,—"The nature of our invention consists in forming a variable pattern that can be put on and fitted to the person, after which it can be taken apart and laid upon the cloth and a garment cut from it."

Claim.—"What we claim as our invention, is the adjustable pattern for cutting garments by, constructed, combined, and arranged as set forth."

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50. For an *Improvement in Cross Sawing Timber, &c.;* Thos. J. Marsh, Liberty, Union county, Indiana, September 28.

Claim.—"What I claim as my invention, is the manner of producing the oblique up and down stroke to the saw for clearing itself from the sawdust or chips, as set forth, by means of the combination of the vibrating lever and sliding carriage, one end of the lever being connected to the arm of the saw frame, and the other end to the pitman rod of the sliding frame and crank shaft."

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51. For an *Improvement in Cotton and Hay Presses;* William Bullock, assignee in part to Charles Bullet, Jersey City, Hudson county, New York, September 28.

The patentee says,—"The nature of my invention consists in procuring an immense power for pressing by the combined mechanical arrangement of the compound levers and toggle joint, in combination with the ordinary block and tackle, which I term my compound lever and toggle joint presses."

Claim.—"What I claim as my invention, is the method of constructing a press; that is to say, a press in which is operated a single toggle joint, by means of an arm which is extended beyond the movable fulcrum of the joint, to the end of which arm the power is applied so as to act in a direction at right angles to the line in which the follower moves; the application of the power being made through the medium of pullies or other analagous device, substantially in the manner set forth."

52. For an *Improvement in Abdominal Supporters;* J. White, S. N. Marsh, and H. Smith, Canajoharie, Montgomery county, New York, September 28.

Claim.—"What we claim as new, is the manner of forming the abdominal pad of three plates of metal, connected together by means of springs, as set forth. We also claim the combining of the perineal with the abdominal pad, under an arrangement of the respective parts, such as is described. We claim likewise the combining of an adjustable pessary with the abdominal pad, substantially as set forth."

List of American Patents which issued in the month of October, 1843, *with Exemplifications by* Charles M. Keller, *late Chief Examiner of Patents, in the U. S. Patent Office.*

1. For an *Improvement in Machines for Mincing Whale Blubber;* George W. Sowle and William Carsley, New Bedford, Bristol county, Massachusetts, October 6.

The patentee says,—The nature of our invention consists in so connecting a knife with a wheel and axle, as that by turning a crank the blubber or other matter shall be cut into uniform pieces of convenient thickness to be tried or boiled out in the kettle."

Claim.—"What we claim as our invention, is the method of arranging the knife; that is to say, attaching the knife directly to the crank and supporting its ends by means of the two jointed arms or cranks."

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2. For an *Improvement in Ships' Windlasses;* Artemus Hammond and William Adams, assignees of A. Hammond, Boston, Suffolk county, Massachusetts, October 6.

Claim.—"I claim the method of relieving the crank shaft from the effects of a torsion strain, viz: by arranging a supplementary pall case with its palls and ratchet wheel, at each end of the shaft and windlass barrel so that at each elevation or depression of the brakes each end of the shaft or windlass shall be actuated or turned in one direction; the whole being substantially as set forth. Also, extending the rear plate of each of the pall cases into the body of the case or beyond the flanch of the circular plate, and forming a curved groove in said plate for the flanch to rest and move in, by which arrangement the access of water into the interior of the arm of the pall case is prevented; the whole being constructed and arranged as set forth."

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3. For an *Improvement in Breaking and Screening Coal;* Joseph Battin, Philadelphia, Pennsylvania, October 6.

Claim.—"What I claim as my invention, is the manner in which I have arranged and combined with each other the breaking rollers and the screen, the respective parts being formed and operating substantially as set forth."

4. For an *Improvement in Smut and Garlic Machines;* William Delany, Cornwall, Grange county, New York, October 6.

Claim.—"What I claim as my invention, is the arrangement of the perforated iron case, metallic beaters, and brushes, in combination with the inclined revolving case, as set forth."

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5. For an *Improvement in Fanning Mills;* David A. Fulk and L. B. McLain, New Lisbon, Columbiana county, Ohio, October 6.

The patentees say,—"The nature of our invention consists in connecting a flexible conductor to the sides of the shoe where the air enters so that none of the wind from the fan shall escape without passing through or under the shoe; the lower sieve or screen at the end net the fan can be elevated or depressed so as to alter its inclination as the work requires. A shaking screen is also attached below the fan in front."

Claim.—"What we claim as our invention, is, 1st, the employment of a flexible conductor for guiding the air into and between the screens in the shoe, constructed and arranged substantially as set forth. 2d. We claim the movable screen in combination with the above, one end of which can be raised or lowered, as set forth. 3d. We claim in combination with the above the additional screen and shaking shoe combined with the fan, in the manner and for the purpose set forth."

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6. For an *Improvement in the Mode of forming Moulds for Casting Cannon Balls or Shot, Bombshells, &c.;* Abial Elliot, Philadelphia, Pennsylvania, October 6.

Claim.—"What I claim as my invention, is forming moulds for casting cannon balls and other articles by moulding the sand, or other materials, in followers having a similar form to the articles to be cast, but of greater dimensions, by which an equal thickness of sand (or other material) can be obtained, and to insure this equal thickness and to facilitate the operation. I also claim in combination with the above claimed method of forming moulds, the employment of a sliding pattern working through a bed plate, in the manner set forth."

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7. For an *Improvement in the Mode of Destroying the Cocoa Grass;* H. B. Kenner, New Orleans, Louisiana, October 6.

Claim.—"What I claim as my discovery, is the use or application of the palma christi nuts, the hemp, and the Jamestown weeds seeds, on or to lands for the purpose of destroying the cocoa grass therein."

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8. For an *Improvement in Bougies for Strictures;* Robert J. Dodd, Philadelphia, Pennsylvania, October 6.

The patentee says,—"The object of my improvement is to guide the bougie in inserting the same into the urethra for the purpose of removing a stricture and to prevent the laceration of the urethra in inserting the bougie, and also to guide the cutting instrument used in removing the stricture and to prevent its point from passing out of the urethra on one side in the operation."

Claim.—"I claim as my invention the said instrument, consisting of the dilator and guiding rod merely, or consisting of the dilator, guiding rod, knife, and knife bearer."

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9. For an *Improvement in the Machine for Sweeping Streets, &c.;* Thos. Mussey, New London, New London county, Connecticut, October 12.

Claim.—"What I claim as my invention is, 1st, the securing rod and the direction in combination with the cart, the eyebolt in the axle of the cart, and the hook on the neap of the machine, to unite and separate the machine and cart with the least possible delay, and to secure them fast together when they are united as described, the cart giving motion to the machine and receiving the dirt as fast as the machine collects it.

"I claim in combination the peculiar manner of constructing the brushes, as set forth, with the sheet iron end pieces, slotes and screw bolts attached, by which combination the brushes are easily extended until they are worn out.

"3d. I claim the combination of the cylindrical apron, the end pieces of wood attached, with the sliding castors, the adjusting levers and screws, the brush frame with its iron plates resting on the balance rocker; also the balance rocker itself; which combination has the effect of sustaining the brushes, holding the dirt to them, and adjusting them to the inequalities of the ground.

"4th. I also claim the ungearing rollers in combination with the springs, clutch boxes on the hubs, the windlass and the ropes or chains connecting the ungearing rollers with the forward end of the brush frame, by which combination the machine is put out of gear and the brush raised, and in this manner rendered capable of being moved about like a wagon."

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10. For an *Improvement in Washing Machines;* Jesse E. Rich, Penfield, Marion county, New York, October 12.

Claim.—"What I claim as my invention, is the combination of the adjustable spring board with the beater and crank shaft, in the manner and for the purposes set forth."

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11. For an *Improvement in Instruments for Regulating Temperature;* David B. Van Tuyl, City of Dayton, Montgomery county, Ohio, October 12.

Claim.—"What I claim as my invention, is the mode set forth of regulating the temperature of apartments, &c.; that is to say, operating valves, &c., for the admission or exclusion of heat, &c., by means of the instrument which I denominate the eucrator, consisting of a hollow cylinder mounted upon an axes and furnished with a hollow rim, the lower half of which contains water; said rim being divided into two chambers, one of which communicates with the air in the hollow cylinder, and the other opening to the external air, all as set forth. Also, in combination with the above, the sliding balance for the purpose of compensating for barometric changes."

12. For an *Improvement in Smut Machines;* Edward Howard, Fredonia, Chautauque county, New York, October 12.

Claim.—"What I claim as my invention, is the construction of the revolving frame or bearers with the inner and outer stationary cylinders, constructed and operating as set forth."

13. For an *Improvement in Shower Baths;* Stephen Bates, Dedham, Norfolk county, Massachusetts, October 12.

The patentee says,—"My improvement consists in suspending the upper or showering basin and parts connected with the same, so that they may be lowered to any required depth to enable a person to pour in the water by raising it a little distance from the floor, and after it is so poured in, the the said basin, &c., may be raised to its original position, or to any height from which it may be desired to have the water fall"

Claim.—"What I claim as my invention, is making or arranging the showering apparatus and turning bucket so that they may be raised or depressed at pleasure, in the manner set forth."

14. For an *Improvement in Meat Cutters;* Harvey H. Evarts, Mount Morris, Livingston county, New York, October 12.

Claim.—"What I claim as my invention, is the manner in which I have arranged the knives projecting out from the revolving disks and so as to pass each other under the hoppers; and also the arrangement of the several hoppers, as set forth."

15. For an *Improvement in Straw Cutters;* James Sanford, Redding, Fairfield county, Connecticut, October 12.

Claim.—"What I claim as my invention, is the method of cutting and bruising straw and hay by means of two cylinders, one having blades or knives and the other strips set in them longitudinally and revolving into each other, so that each strip in one passes near by the corresponding edge in the other and presses the straw or hay upon the edge, in the manner set forth.

"I also claim the method of entering the blades and strips into the cogs, by means of which I am enabled to use thinner blades and strips than I could otherwise do, to support them in their places in the most effectual manner without allowing them to interfere with each other and to make the cogs answer a double purpose, whereby both the weight and expense of the machine is diminished."

16. For an *Improvement in the Method of Feeding Nail and Tack Plates, &c., into Machines for Cutting Nails and Tacks, &c.;* James Thompson and Halsey Rogers, assignees of Walter Hunt, City of New York, October 12.

Claim.—"What I claim as my invention is, 1st, the plyers or feeding tongs, constructed as set forth, in connexion with the spring and the feeding rod as forming a new and useful instrument for the purposes set forth. 2d. I claim the plan of griping and disengaging the feeding rod between the rollers by means of the combined arrangement of the crank or lever, the camb shaft, the screw camb, the lever, and the bracket, constructed and combined in the manner set forth, or similar thereto."

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17. For an *Improvement in Mop Irons;* Salmon Johnson, Lee, Oneida county, New York, October 18.

The patentee says,—"My invention consists in the application of a spiral spring of iron or brass wire, or other suitable material for a spiral spring, to force and hold together the two parts of a mop iron or frame which holds the yarn of which the mop is made, and constructed in the manner set forth. I make no claim for any portion of the invention excepting the constructing the mop irons in the manner set forth; that is to say, operating the upper iron or movable holder by means of the spiral spring combined therewith, in the manner set forth."

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18. For an *Improvement in Cooking Stoves;* Henry T. Butler, assignee of Laban Eddy, Taunton, Bristol county, Connecticut, October 18.

Claim.—"I claim the improvement in the Hathaway cooking stove, as set forth; that is to say, I claim the peculiar form or arrangement of the flue which conducts the heat and smoke in contact with the back and bottom plates of the oven; that is to say, the combination of the vertical undivided flue space in rear of the oven, through which the smoke descends with the two lateral horizontal flue spaces and central flue underneath the said oven and connecting with the discharge flue; the whole being substantially as set forth."

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19. For an *Improvement in the Door Lock or Latch;* William Hall, Chelsea, Suffolk county, Massachusetts, October 18.

Claim.—"What I claim as my invention, is the mode of constructing the parts which operate the latch bolt and knobs, or by which the said latch and knobs are actuated by means of a single spring, as set forth, viz: the combination with the latch and the slide or fork (of the tumbler) of the lever and spring; the said lever turning on a fulcrum or pin at its upper end and resting, when thrown forward, against a shoulder of the fork or slide of the tumbler, and being jointed or otherwise properly connected to the latch bolt, and having the spring which throws it forward applied to it at a point between its fulcrum and the latch bolt; the whole being arranged and operating substantially as set forth."

20. For an *Improvement in Looms for Working any Number of Heddles;* Gavin McCrae, Baltimore, Maryland, October 18.

The patentee says,—"The nature of my invention consists in the apparatus by which I can raise any number of heddles in any pattern by means of one treadle."

Claim.—"What I claim as my invention, is the combination of the endless chain of lays having pins projecting therefrom in the manner set forth, with the needles; and also in combination with the above, the lever-acting catch bar for raising an even shed, in the manner set forth."

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21. For an *Improvement in Water Wheels;* Amasa B. Beckwith, Bath, Steuben county, New York, October 20.

Claim.—"What I claim as my invention, is the peculiar arrangement and construction of the curvilinear or screw sharpened buckets in combination with the bell shaped hub segment buckets and scolloped and flaring rims, as set forth."

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22. For an *Improvement in Ploughs;* William and Matthew C. Walker, Washingtonville, Columbia county, Pennsylvania, October 20.

Claim.—"What we claim as our invention is, 1st, casting the mould-board with the wing and mortise behind it for the admission of the hook of the land-bar, in the manner and for the purpose set forth; and with the recess in the landside of the mould-board to admit the forward part of the land, made of a corresponding shape, as set forth; and in combination with the above, the tongue to fit into a corresponding groove or notch, in the manner and for the purpose set forth. 2d. The manner of forming the land-bar with a hook on its forward end to hook or lock into the notch in the mould-board, as set forth."

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23. For an *Improvement in the Combination Safety Lock for Doors, &c.;* Linus Yale and Chas. Wilson, Springfield, Hampden county, Massachusetts, October 20.

Claim.—"What we claim as our invention is combining a revolving and sliding spindle and arm with one or more rotating disks notched in their peripheries or flanches, in the manner and for the purpose set forth, by which the spindle is made to perform the triple purpose of turning the disks, throwing the bolt, and closing the aperture in the case, the bolt being prevented from being pressed back simultaneously with the turning of the disks; and the introduction of false keys or other implements to the interior of the lock is also prevented.

"And we also claim the combination of the rotating and sliding spindle in combination with two rotating disks having the same centre of rotation, so that by the sliding and turning of the spindle it can be made to act on the two disks alternately, as set forth."

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24. For an *Improvement in Cooking Stoves;* Benjamin T. Roney, Milton, Northumberland county, Pennsylvania, October 25.

The patentee says,—"The nature of my invention consists in placing the draught in the centre of the sides of the stove under the fire chamber, which fills the whole of the upper part of the stove; there being four diving flues, one at each corner, the draught to which is regulated by dampers, as is the centre draught to either end of the stove."

Claim.—"What I claim as my invention is, 1st, the centre draught arranged and combined with the fire chamber substantially in the manner set forth, and having a shifting damper so as to regulate the admission of air, as set forth. I also claim the employment of the diving flues, constructed, arranged and combined with the centre draught, in the manner set forth."

25. For *an Improvement in Cooking Stoves;* Alpheus Cooper, Danville, Columbia county, Pennsylvania, October 25.

The patentee says,—"The nature of my invention consists in adapting the stove to burning wood or coal, and with the latter to combine a hot-air chamber to convey heat to the oven."

Claim.—"What I claim as my invention, is the formation of a hot-air chamber by means of the cylindroid and cap plate in the fire chamber of a wood stove, thus changing it into a coal stove and at the same time applying heat to the oven, in the manner and for the purpose set forth."

26. For an *Improvement in Elastic Stops for Checking the Force or Momentum of Water in Pipes;* Horatio Allen, City of New York, October 25.

The patentee says,—"The combination which I have invented consists in placing in contact with the water in water pipes containing water under pressure, an elastic material within which, or on the opposite side of which, is a volume of air or other elastic body under the same pressure with the pressure of the water."

Claim.—"What I claim as my invention, is the combination set forth whereby an elastic enclosing material or an elastic separating material is interposed between the air or other elastic body and the water, whose momentum is to be provided for; and also the combination of an elastic sheet or tube with the pipe containing water under pressure, whereby the elastic material forms a part of the enclosure of the water, and by its elasticity a yielding substance is provided for the momentum of the water."

27. For an *Improvement in the Method of Introducing Wire into Metallic Pipes;* S. F. B. Morse, City of New York, October 25.

The patentee says,—"The nature of my invention consists in substituting a hollow mandril for the solid mandril used in making metallic pipes, which hollow mandril I use for the purpose of introducing with facility wires of considerable lengths within said pipe."

Claim.—"What I claim as my invention, is the method of introducing wires in hollow pipes whilst making the same by introducing the wires through a hollow mandril on which the pipe is made substantially in the manner set forth."

28. For an *Improvement in Ice Cutters and Markers;* Nath'l J. Wyeth, Cambridge, Middlesex county, Massachusetts, October 25.

Claim.—"What I claim as my invention, is the use or combination of bearing runners with the back bar or planks to which the cutters or chisels are fastened, (however the said parts may be connected,) by which combination a cutter or marker may be moved about from place to place with facility.

"I also claim the connecting the said runners with the back bar or parts to which the cutters are attached by means of the turning lever bars, arranged as set forth, which arrangement permits the cutters to be moved up and down between the runners at pleasure, and serves peculiarly to preserve the perpendicularity of the cutters, and also to move all parts of the cutting apparatus equally: and furthermore, I claim the combination of a rack bar (straight or crooked) with the movable guiding handles and confining pin passing through the same, and with the back bar aforesaid, for the purpose of confining the cutting apparatus in any desired position; the whole arrangement operating substantially as set forth."

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29. For an *Improvement in Globes;* Gilbert Vale, City of New York, October 28.

Claim.—"What I claim as my invention, is the movable horizon attached to the meridian and moving as the figure representing the traveler moves. I claim also the application of the celestial globe in sections, rendered transparent to the sphere, as explained. I also claim the application of this instrumant as a planetarium by the introduction of wires representing the orbits of the planets and showing their modes and inclinations."

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30. For an *Improvement in Connecting Stop-Cocks for Hydraulic Presses;* Charles Wilson, City of New York, October 28.

Claim.—"What I claim as my invention, is the combination of two stopcocks with the bramah or other hydraulic presses when two cylinders or presses are to be used, in the manner and by the mechanical means substantially as set forth; the said cocks being so connected with such presses, and with each other, as that one of them will be opened into one cylinder at the same time and with the same motion that the other is closed upon the other cylinder."

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31. For an *Improvement in Wheel Ploughs;* Thomas D. Burrell, Geneva, Ontario county, New York, October 28.

The patentee says,—"The nature of invention consists in removing the sole of the landside and placing an inclined wheel, denominated a shell wheel, between the landside and the mould board, with its face in a line with the cut of the coulter; the landside curves up from the point of the share and backward to the junction of the handle and beam. The beam is halved on the landside on the outside, and the handle is affixed to the side of it, the whole being secured by a screw bolt passing through them this forms a secure joint without tenon and mortise, and without materially weakening the beam or handle."

Claim.—"What I claim as my invention, is the shell wheel, constructed substantially as set forth, combined with the plough in the manner and for the purpose set forth. I also claim the guard or scraper in combination with the shell wheel. I also claim the mode of connecting the beam, landside and handle."

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32. For an *Improvement in Washing Machines;* James Hutchinson, Martinsburg, Berkley county, Virginia, October 28.

The patentee says,—"The nature of my invention consists in combining what I denominate a cylinder of rollers with an elastic movable concave, the whole being arranged and placed above a furnace and boiler."

Claim.—"What I claim as my invention is, the combination of the flexible concave and cylinder of rollers, constructed and arranged substantially as set forth."

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33. For an *Improvement in the Endless Chain Horse Power;* Salmon Richards, East Poultney, Rutland county, Vermont, October 28.

Claim.—"What I claim as my improvement, is the manner of forming and connecting together the segments which constitute the horizontal floor, said segments each carrying one pair of bearing wheels, and the whole being connected together by hinge or rule joints and being furnished with ledges to support the contiguous segment; the whole being formed substantially in the manner set forth."

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34. For an *Improvement in Cars and Receiving Platforms for Removing Blocks of Ice;* Nathaniel J. Wyeth, Cambridge, Middlesex county, Massachusetts, October 28.

Claim.—"I claim the combination (of the front and rear end of a car) of a sliding plank, suspended from a strip of cloth of suitable width, and connected to a turning shaft in the upper part of the car, so as to be wound or unwound upon or from the same, with a hinged plank or door at the bottom of the car opening outwards, and having projecting slides or bars fastened to the upper or inside of the same; said combination being arranged and operating substantially as set forth, to open or close the end of the car at pleasure.

"I also claim the supporting the transverse lever bars of the cars and receiving platforms upon the turning cams or eccentrics connected together by an arm, so that by turning one of said cams, by means of a lever or otherwise, the positions of the lever bars may be varied in the manner and for the purposes set forth; the arrangement and operation being substantially as set forth.

"I claim the arrangement of a metallic bar or rail vertically or edgewise, in or on the transverse lever bars, so that when the lever bars are raised to the elevated horizontal position mentioned, the said rails shall hold the blocks of ice or prevent any essential movement of them when the cars are suddenly started or stopped, the arrangement and operation being substantially as set forth."

List of American Patents which issued in the month of November, 1843, *with Exemplifications, by* CHARLES M. KELLER, *late Chief Examiner of Patents in the U. S. Patent Office.*

1. For an *Improvement in Casting Printing Type;* David Bruce, Jr., Williamsburg, Kings county, Long Island, New York, November 6.

Claim.—"What I claim as my invention is, 1st, the male plate constructed with a nipple protruding beyond its back surface and springs attached to the plate, arranged and operating substantially as set forth.

"2d. I claim the method of opening and closing the mould and tilting the matrix by the combination and arrangement of the compound vibrating arm and lever, arms and spring; said lever having a simultaneous vibrating movement on an axis on the vibrating arm in the manner and for the purpose set forth; and this combination and arrangement I claim whether effected in the manner set forth, or in any other manner substantially the same.

"3d. I claim the adjustable mould block combined with the vibrating arm for the purpose set forth,

"4th. I claim the combination of the adjustable frame with the lower adjustable mould block in the manner and for the purpose set forth.

"5th. I claim the circular collar perforated with a rectangular opening in the centre to admit the rectangular shaft or stem of the upper mould block, with the hinge piece and adjustable frame, in the manner and for the purpose set forth.

"6th. I claim the manner of supplying the melted metal to the mould by a horizontally and vertically perforated piston, placed below the level of the bottom of the metal pot, arranged and operated in the manner set forth, by which the metal is forced into the mould at a lower temperature than heretofore effected, and the metal remaining in the mouth of the female plate (after the type has been cast) is drawn back into the seat or chamber of the piston as the piston rises, by which the mouth of the female plate is prevented from being stopped or choked by congealed metal.

"7th. I claim the combined arrangement of these several parts, namely, the lever, cam, spring, rod, and vibrating beam, by which the piston is operated as possessing advantages as set forth.

"8th. I claim placing the vibrating mould arm between the furnace and the propelling or cam shaft, as set forth."

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2. For an *Improvement in Bee Hives;* Joseph Miller, Lexington, Stark county, Ohio, November 6.

Claim.—"What I claim as my invention, is the arrangement of the cells so that they are suspended from their top and can be removed or replaced from the top of the hive by sliding them in or out vertically, the cells being so arranged and formed at the bottom that they shall present two inclined surfaces as set forth; and I claim in combination with the above, the arrangement of the board so as to have an entire clear space between them and the bottom of the cells."

3. For an *Improvement in the Box Trap;* Jacob Stroop and John Esteale, Allegheny, Pennsylvania, November 6.

Claim.—"What we claim as our invention, is the turnstile operated substantially as described in combination with the sets of bars, H, and also with the sets of bars W, as set forth. We further claim the turnstile in combination with the treadle, and also with the box trap, for the purpose and in the manner set forth."

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4. For an *Improvement in Machinery for Elevating Blocks of Ice from the Surface of the Water to a Higher Level;* Nathaniel J. Wyeth, Cambridge, Middlesex county, Massachusetts, November 6.

Claim.—"I claim the use, formation or arrangement of a snow track groove or box between the horse track or path and the guide rails of the ascending and descending inclined planes for the purpose of facilitating the movements of the sled up and down said planes. I also claim the combination of an ice sled formed in sections, with the groove or box aforesaid, and the horizontal rails hereinbefore described, for the purpose of raising ice from one level to a higher one, the whole being arranged and operating substantially as set forth."

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5. For an *Improvement in Making Coopers' Hoops out of Split Timber;* James McWhorter, Blooming Grove, Franklin county, Indiana, November 6.

Claim.—"What I claim as my invention, is the manner of arranging and combining the drum with its screw shaft and pincers with the sliding shaft, with its pinion and plate, so as by their joint action to draw the split forward and cause the dressed hoop to wind around the drum, and its appendages, being also combined with the cutting or dressing apparatus, so as to constitute a machine substantially as set forth."

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6. For an *Improvement in Washing Machines;* Arthur Mitchell, Aberdeen, Brown county, Ohio, November 6.

The patentee says,—"The nature of my invention consists in constructing a washing machine having a follower that moves up towards the end against which the clothes are washed, parallel with it and in a right line, being steadied in its course by guides and ways; and also in the formation of the end against which the clothes are washed."

Claim.—"What I claim as my invention, is the follower, constructed, arranged, and operating in the manner set forth."

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7. For an *Improvement in Cooking Stoves;* John E. Thomas, Albany, New York, November 6.

The patentee says,—"The nature of my invention consists in constructing a stove having a diving flue on each side and combining therewith non-radiating substance on the outside around the oven; part of the flue being ribbed to extend its radiating surface."

Claim.—"What I claim as my invention, is the combination of the diving flues having an opening into the lower horizontal flue at the front end, with the back flue, the heat passing along the whole length of the oven at the bottom, and up behind so as to surround it, constructed and arranged as set forth. I also claim the combination therewith of the dampers for conducting the heat out more fully under the boilers."

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8. For an *Improvement in Straw Cutters;* Chas. S. Gaylord, Gaylord's Bridge, Litchfield county, Connecticut, November 6.

Claim.—"What I claim as my invention, is the form of the knife as applied to the cutting of hay, straw and stalks; it being so shaped as to divide their volume and their resistance when cut, by presenting and securing for these purposes the action of two cutting edges at the same time."

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9. For an *Improvement in Propelling Vessels;* Sylvester W. Hall, Troy, Rensselaer county, New York, November 6.

The patentee says,—"The nature of my invention consists in making use of the buoyant force of atmospheric air discharged in channels or grooves under the vessel to propel it by causing the air to act in its ascent against an inclined surface of the vessel, by which the buoyant force of the air is transmitted according to the known laws which govern the action of forces of this nature on inclined surfaces and tends to give motion to the vessel in a direction contrary to that in which the surface rises and the air tends to escape."

Claim.—"What I claim as my invention, is, 1st, the application of the buoyant force of air immersed in water to the lower surface or bottom of the boat inclined upwards, as set forth, in combination with such a channel, channels, grooves, or form of contrivance, as may admit the water to flow freely from the bow to supply the place of the air as it escapes toward the stern and prevent its rising up at the sides of the vessel. The peculiar feature of the improvement claimed, is that the air passes in channels or spaces open downward and from the bow, instead of in trunks or recesses closed below, which would prevent the water rising upward into the channels as the air escapes, as has been before known.

"2d. For the purpose of causing the air to issue in distinct jets, or blasts, and directing it into a channel, or into different channels, I claim the use of the slide valves and compartments, as set forth, in combination with the channels or grooves on a surface inclined upward, as set forth."

"3d. For the purpose of moving side ways and turning the boat, I claim the employment of air conveyed through suitable tubes or passages from the blowing or other machinery by which it is furnished to the points of discharge under the fore or after part, or under the fore and after part of the boat, so as to operate on the inclined surface on the sides of the boat, as set forth."

10. For an *Improvement in Lard Lamps;* Thomas Houghton and Robert F. Wallace, City of Philadelphia, Pennsylvania, November 15.

Claim.—"What we claim as our invention, is the peculiar construction of the wick-holder and conductor having the two semi-circular chambers near the top and forming shoulders for suspending it to the screw cap, in the manner and for the purpose set forth."

11. For an *Improvement in the Air Pump used in Low Pressure or Condensing Steam Engines;* Charles Reeder, City of Baltimore, Maryland, November 15.

Claim.—"What I claim as new, is the manner of arranging the valves of the pump and condenser, and connecting and combining them with each other, so as to render the said pump double acting, whilst its piston is provided with valves as in the common single acting air pump; that is to say, I claim the arrangement of the air pipe with its valve opening into a water space between the upper side of the piston and the head of the cylinder, in combination with the valved piston, the foot valve, and the discharge valves, by which arrangement and combination the apparatus is made to operate as set forth. I have stated that I do not claim either of the individual parts as new, and I consequently limit my claim to the combination as a whole, but without intending to limit myself to any particular form of the respective parts."

12. For an *Improvement in Coffins;* Christian H. Eisenbrandt, City of Baltimore, Maryland, November 15.

Claim.—"What I claim as my invention, is the combination of a spring catch within the coffin with a rod and ring to be slipped on to the finger of the subject within, as set forth. I also claim the forehead plate in combination with the spring catch and rod or wire, whether by means of the lever, or other means substantially the same, whereby the catch is opened by the motion of the subject's head, as set forth. And, finally, I claim the air plate in the lid of the coffin in combination with the devices above claimed for opening the lid from within, as set forth. It is intended to place the coffin with its inmate in a vault, with a key of the vault deposited inside of its entrance until decomposition takes place, so that should the person not really be dead, life may be preserved."

13. For an *Improvement in the Table Blow Pipe;* Rufus Somerby, Louisville, Jefferson county, Kentucky, November 15.

Claim.—"What I claim as my invention, is the manner in which I have arranged the blow pipe and furnace in combination with the bellows; the whole being constructed and arranged as set forth."

14. For an *Improvement in Smut Machines;* John Coleman, Blacklegs, Indiana county, Pennsylvania, November 15.

The patentee says,—"The nature of my invention consists in constructing a runner with spikes standing out at an angle of about 200, more or less, from the periphery and upper face near the edge, the points of said spikes running near the case which, in the cover, has inserted a flanch and spikes near the rim, and also attaching a fan below the upper disk, having a head as broad as the wings are long on their under side, the hole in the middle of said head being large enough to admit air from below."

Claim,—"What I claim as my invention, is the runner having a rasp at its centre and projecting angular spikes at its periphery, constructed and arranged as set forth. I also claim in combination with the rasp above named, the springs around the aperture in the cover, in the manner and for the purpose set forth. Lastly, I claim in combination with the disk above named, the fan having a lower head and tube combined therewith for the purpose of admitting and directing the blast, constructed and arranged substantially as set forth."

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15. For an *Improvement in Rotary Steam Engines;* Ebenezer Ferren, Haverhill, Grafton county, New Hampshire, November 15.

The patentee says,—The nature of my invention consists in forming a rotary engine with two pistons revolving with the shaft in two separate chambers; the steam being let on so as to cause them to revolve in either direction and cut the steam off at any point of the revolution."

Claim.—"What I claim as my invention, is the combination of the slots in the disk (to which the piston is attached, and which works in recess containing the steam ways,) with the four holes in the recess, two for ingress and two for egress, so as to allow the steam to be cut off and work expansively. I also claim in combination with the above, the pistons and cylinder, constructed and arranged in the manner and for the purpose set forth, so as to let the steam into both steam chambers by one operation, their action being regulated by the disk."

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16. For an *Improvement in Modes of Using Volatile Oils for Purposes of Illumination;* B. F. Greenough, Boston, Suffolk county, Massachusetts, November 15.

The patentee says,—"The nature of my invention consists in passing a current of steam from boiling water through chemical oil, spirits of turpentine, or other analogous substance, and conveying the united steam or vapor through proper pipes to be burned, the vapor issuing from the burner by means of the pressure of the steam."

Claim.—"What I claim as my invention, is combining a reservoir having burners attached thereto by pipes or otherwise, with a steam boiler, substantially in the manner set forth, so that the vapor generated by the steam will be forced through the turpentine pipes to the burners under the pressure of the steam, for the purpose set forth."

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17. For an *Improvement in Boot Crimps;* Eli P. Drake, Troy, Rensselaer county, New York, November 15.

Claim.—"I claim the division of the crimp board into parts, as set forth.

I also claim that combination of the lever and pincers upon the foot piece and back board by which the leather is clasped to the foot piece and back board. And here I claim the privilege of using this combination of the lever and pincers upon the block, if I should find it convenient to do so, instead of using the nut and pincers, as set forth. I also claim the combination of the foot piece, back board, block, screw, nut, and pincers, by which combination, when the screw is turned, the block is raised against the foot piece and back board, lifting them upwards and outwards, and at the same time the nut is raised against the pincers, thereby clasping the leather firmly to the block; the result of the whole combined movement being to stretch the leather in three different directions at once, aud crimp it fit for use. I also claim the combination of the foot piece, back board, block, and screw, by which, when the screw is turned, the block is raised against the foot piece and back board, lifting them upwards and outward at the same time; the leather in this case being clasped to the block by the lever and pincers, as in my second claim above mentioned. Wherever pincers are named, I only claim them in combination with other parts of the machine."

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18. For an *Improvement in Grain Cleaners;* F. P. Root, Sweden, Monroe county, New York, November 15.

Claim.—"What I claim as my invention, is the use of the horizontal wheel with pins projecting from its periphery for preventing the endless chain of bars from choking with straw, in combination with the conveyor, as set forth."

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19. For an *Improvement in the Saw Mill for Sawing Timber with a Direct or Compound Level;* James Hamilton, City of New York, November 21.

Claim.—"What I claim as my invention, is the mode of mounting and applying the rotary dog and leveling lever in combination with the slotted guide bar *i*, bar *f*, bar *k*, and lintel, for the purpose and in the manner set forth. And, finally, I wish to be understood as covering all the mechanical variations that shall or may be really or substantially the same."

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20. For an *Improvement in Door Latches and Locks;* Theodore L. Littlefield, City of Philadelphia, Pennsylvania, November 21.

The patentee says,—"The nature of my invention consists, 1st, of a latch bolt case, the shape of which is part round, or cylinder, and part square, into which is to be introduced a latch bolt and a spiral spring, the latter, or spiral spring, being placed around the spindle or round part of the latch bolt, and working inside of the cylinder, or barrel part of the case; also, of a flat sliding bar or thumb piece to move back the latch bolt, which bar or thumb piece passed through the round head or bolt stop fastened to the back end of the latch bolt spindle, and slides backward into or partly through the neck, stem, or straight part of an immovable or stationary knob or knobs, the whole forming a latch for a door. And, 2d, of a combination of the above described latch bolt, round head, or bolt stop, spiral spring and bar, or thumb piece, in connexion with one or more tumblers, which tumbler or tumblers being moved by a key against a corner of the square part of the latch bolt, and held by a spring or springs, fastens or locks the latch bolt. The latch bolt, spiral spring, the tumbler or tumblers, and the tumbler spring, being placed inside of an oblong case, which may be composed of metal or other substance, in connexion with the other parts, forms a lock for a door."

Claim.—"What I claim as my invention, is making a recess in the neck of the knob in combination with the sliding bolt of the latch having a thumb piece or pin to enter the said recess, as set forth."

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21. For an *Improvement in Stop Cocks;* Francis Joseph Miller, City of New York, November 21.

The patentee says,—"The nature of my invention consists in making the pipe constitute of itself a stop cock, by which, in cases where a cock is necessary, the pipe is rendered more easy of construction, and offers less obstruction to the passage of the fluid."

Claim.—"What I claim is the mode of combining a jet pipe and stop cock; that is to say, making the jet pipe the revolving part of the stop cock, in the manner set forth."

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22. For an *Improvement in Artificial Writing Slates;* John Street, City of Philadelphia, Pennsylvania, November 21.

The patentee says,—"The nature of my invention consists in applying a silicious composition to wood, for the purpose of forming a wooden writing slate."

Claim.—"What I claim as my invention, is a wooden writing slate of a variety of colors, formed by the application of the composition set forth, to smooth surfaces of wood of any desired size and thickness."

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23. For an *Improvement in Umbrellas;* Waring Latting, City of New York, November 21.

Claim.—"What I claim as new and as of my invention, is, 1st, the construction and arrangement of the hollow handle of the umbrella, so that the covers, stretchers, &c., can be attached to or detached from it, substantially as set forth, and when disconnected can be put into said hollow handle, by which means the apparatus becomes a walking stick. 2d. The combination of the cylinder, with its shoulder, latch and button, and screw to receive the runner cylinder and thimble with the grooves and small washer to mount the ribs and form an umbrella that can rotate on its center when in use."

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24. For an *Improvement in Cotton Presses;* W. F. and Chas. J. Provost, Lower Three-Runs, Barnwell county, South Carolina, November 21.

The patentees say,—The nature of our improvement consists in the arrangement of the levers and their mode of operation by means of a capstan turned by horse or other power."

Claim.—"What we claim as our invention, is the combination of the segment rack with the levers, constructed and arranged in the manner and for the purpose set forth."

25. For an *Improvement in the Machine for Tapping and Inserting Stop Cocks in Pipes under Hydrostatic Pressure;* Horatio Allen, City of New York, November 21.

Claim.—"What I claim as my invention, is the combination of the levers, which operates the drill stock or stop cock shaft, with the lever and stopper, as set forth, whereby the removal of the drill and the rapid and secure covering of the hole is effected by one operation, and in a similar manner by a single reverse movement the hole is uncovered and the cock inserted."

26. For an *Improvement in Making Cane Hemp for Making Paper, &c.;* Barzillai C. Smith, Burlington, Burlington county, New Jersey, November 21.

Claim.—"What I claim as my invention, is the method of making what I call cane hemp, by three processes, the one by fluoric acid gas, also the one by lime water or cream of lime and pot ash, or soda solution, and that by high pressure of water or steam."

27. For an *Improvement in Rotary Bellows;* A. Savage and Hervey Killam, Scottsville, Monroe county, New York, November 24.

Claim.—"What we claim as our invention, is the order and arrangement of any number of bellows in succession, around any given diameter of circle forming a bellows wheel, the centre part of the bellows being moved, and the outsides stationary, forming a double stroke, it being a new arrangement by which we collect atmospheric air into its outer extremity, and force it into the cylinder or shaft of the wheel, and discharge it out at its centre, being wholly done by the power of falling bodies or gravitation, said bodies being so arranged as to vibrate, and of sufficient size and thickness, so as to produce any desired quantity or velocity of air that may be wanted for ordinary purposes."

28. For an *Improvement in the Method of Working a Floating Dry Dock, in connexion with a platform and basin, by means of which vessels can be raised and deposited on beds or railways, &c.;* Rutherford Moody and Samuel D. Dakin, City of New York, November 24.

The patentee says,—"The nature of our invention consists in providing a basin sufficiently large to receive the dock with a vessel upon it, and to enable the dock to turn around within, if it is desired, with a platform in its bottom, made perfectly level and low enough to admit the water to flow over it at any desired depth; the side walls of the basin to be constructed of timber or stone, or other masonry in the usual manner, and the platform to be made of concrete or stone, or other masonry laid upon the earth, or of piles of timber driven into the earth and capped, with other timbers framed across their tops, with a plank flooring covered with concrete or stone, or other masonry."

Claim.—"What we claim as our invention, is the employment in combination with a floating dry dock of a level or horizontal platform under water in a basin, made of concrete, masonry, or piles, or in any other manner to receive a floating dry dock, and allow it to float and turn in the basin, and to settle and rest on the platform in any required direction, in connexion, if desired, with bed ways or rail ways upon the shore; the basin to be so shallow compared with the water in which the dock is sunk to receive the vessel, as to receive and form a bed for the said dock, and leave the cradle on which the vessel rests level with the bed or rail ways on the edge of the basin."

29. For an *Improvement in Ploughs;* James B. Moore, Wilmington, New Castle county, Delaware, November 24.

The patentee says,—"The nature of my invention consists in the peculiar construction of the land side and cutter, and the adaptation of the other parts thereto."

Claim.—"What I claim as my invention, is the land side formed of three plates, constructed and arranged in the manner and for the purpose set forth. I also claim in combination therewith the double cutter, in the manner set forth."

30. For an *Improvement in Spring Saddles;* Robert Spencer, City of New York, November 24.

Claim.—"What I claim as new, is the giving of elasticity to the horns of a lady's saddle, by making them separate from the body of the tree, and sustaining thereon by means of spiral or other springs, and sliding bolts, whether said springs and bolts be arranged precisely in the manner set forth, or in any other substantially the same. I also claim the manner of arranging the stirrup leather or strap, in the lady's saddle, by bringing it under the body of the horse and passing it through the stirrup bar, for the purpose set forth."

31. For an *Improvement in Washing Machines for Cleaning Rags;* James Phelps, West Sutton, Worcester county, Massachusetts, November 24.

The patentee says,—"The nature of my invention consists in abstracting the impure water and dirt from the common engine, for washing and beating rags, by means of an octagonal revolving box, raising the water and discharging the same at the centre, at one end, through a cylinder, or otherwise, the box containing buckets for that purpose."

Claim.—"What I claim as my invention, is the employment of a revolving box, having a covering of wire cloth or other suitable material, inside of which are buckets for filtering or straining water, and elevating the same substantially in the manner and for the purpose set forth."

32. For an *Improvement in Cast Iron Plane Stocks;* William Foster, Washington City, District of Columbia, November 24.

The patentee says,—"The nature of my invention consists in forming a recess in the face of the plane stock, into which an adjustable piece of soap stone, or other suitable material, is inserted and regulated by a screw.

Claim.—"What I claim as my invention, is the recess formed in front of the plane iron, or of the forward handle in the face of the cast iron plane, and filled with soap stone, or other suitable material, which is so regulated by a screw substantially as set forth."

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33. For an *Improvement in Gangs of Ploughs;* Thomas Wiard, East Avon, Livingston county, New York, November 24.

The patentee says,—"The nature of my invention consists in attaching to a gang of ploughs, a pole, or shafts, so as to allow the ploughs freedom of action, and at the same time keep a straight furrow."

Claim.—"What I claim as my invention, is the combination of a pole, or shafts, with a frame and gang of ploughs in the manner set forth, in such a way as that they will have an up and down motion, while all lateral motion is prevented in the pole or shafts independent of the ploughs."

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34. For an *Improvement in Machines for Making Hats of Leather, India Rubber, &c.;* Sewell Gleason, City of New York, November 24.

The patentee says,—"The nature of my invention consists in an apparatus by which a piece of leather, india rubber, cloth, or other suitable material is pressed into the form of a hat by one operation."

Claim.—"What I claim as my invention, is the combination of the bed piece and elastic metallic hoop. I also claim in combination with the above the block, cap, and screw for pressing the leather into the bed, as set forth. I also claim the employment of the metal ring, held down by springs, in combination with the block for holding the leather to be pressed, while the block forces it down, and the elastic hoop, as set forth. Lastly, I claim the elastic metalic band formed of a metal ring, the end of which overlap, and which is grooved on the outside in combination with a spiral spring which surrounds it, as set forth."

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35. For an *Improvement in the Method of Making Wrought Iron Cannon;* Salmon Hunt, Woolcotville, Litchfield county, Connecticut, administrator of the estate of Salmon Hunt.

The patentee says,—"The nature of said invention consists in forging a gun or piece of ordnance, by welding to a centre rod called a "forming bar" a succession of plates, so prepared and beveled at their edges as to form longitudinal and transverse laps with each other, and so placed in the formation of the gun as to make the grain of the iron to be in a transverse or nearly transverse direction to its length around the same."

Claim.—"What I claim as my invention, is the particular manner set forth of welding to a centre rod, (which is afterwards to be bored out of the gun,) a laminal succession of plates or billets of iron, in such a manner as to give the direction of the grain of the iron transversely around the body of the gun, or nearly so, upon the principle and in the manner set forth."

List of American Patents which issued in the Month of December, 1843, *with Exemplifications by* Charles M. Keller, *late Chief Examiner in the U. S. Patent Office.*

1. For an *Improvement in Machinery for Straightening and Cutting Veneers and other thin pieces of Wood;* Chauncey E. Warner, City of New York, December 4.

Claim.—"What I claim as my invention, is, 1st, the mode by which the operation of the clamps and their guide points is combined with the feeding rollers, and for the purpose of steadying the material, and feeding at the same time without distress to the feeding rollers; when such combination is applied for feeding the material, to cut veneers, or wooden cards, for boxes or covers, substantially as set forth. 2nd, I claim the cutting of successive veneers, or wooden cards, for boxes or covers, and carrying them forward to the straightening rollers, by the combination of the knife and keeper spring with each other, and with the feeding apparatus, when such entire combination is applied to the purposes set forth. 3rd, I claim the use of the straightening roller and concave guide beneath, for the purpose of drawing the veneers, or cards, out from the knife and lip, and straightening the material in its passage, when such use is applied in the manufacture of veneers, or wooden cards, meant to form boxes or covers; and I claim the combination therewith of the lip, adjusted to direct the successive veneers, or cards, in their exit from the roller and guide, and place the cards collectively together, as set forth."

2. For an *Improvement in Rotary Steam Engines;* Royal C. Grant, Pomeroy, Meigs county, Ohio, December 4.

The patentee says,—"The nature of my invention consists in using the slide valve in the steam chamber as a cut off, and the apparatus for transferring the steam from one engine to another."

Claim.—"What I claim as my invention, is, 1st, the recess in the valve for a steam way, which cuts off the steam as the valve rises, in the manner and for the purposes set forth. 2nd, I claim the valve box and combination of valves therein, in combination with the cylinder, constructed and arranged as set forth."

3. For an *Improvement in Carriage Brakes;* Moses S. Woodward, Marshalton, Chester county, Pennsylvania, December 4.

The patentee says,—"My improved manner of constructing the carriage brake is applicable to carriages either with or without springs, its design being to cause the lock pieces which are to bear against the wheels to press in the direction of their axis, notwithstanding any variation in the distance between the ends of the axles and the bottom of the body of the carriage, such variations being caused by the irregularities of the road."

Claim.—"What I claim as my invention, is the arrangement and combination with the rock shaft and axle, of what I have denominated, the radius bars for preserving the distance unchanged between said rock shaft and axle, notwithstanding the vertical vibration of the axle; and this I claim whether applied to vehicles with two or four wheels, and whether the respective parts be formed precisely in the manner set forth, or in any other in which the same result is attained."

4. For an *Improvement in Making Paper;* John M. and Lyman Hollingsworth, Boston, Suffolk county, Massachusetts, December 4.

The patentees say,—"The nature of our invention consists in making an exceedingly firm, smooth, and strong paper from the substance generally known as manilla grass, being the fibrous portion of the bark of the wild bananna, (Musa Textilis)."

Claim.—"We claim to be the first discoverers of the fact that the gummy, resinous, or other matters, which bind together the fibres of the substance known as manilla grass, may be so dissolved by the process of boiling in an alkaline ley, that the fibres will become separated, and a material produced capable of being manufactured into paper of the best description. And we consequently claim as our invention, the application of the chemical process of boiling in caustic alkaline ley, substantially in the manner set forth, to the vegetable substance known as manilla grass, for the purpose of preparing the same to be converted into paper."

5. For an *Improvement in Straw Cutters;* Abel A. Hull, Croton, West Chester county, New York, December 4.

Claim.—"What I claim as my invention, is the way or manner of giving to the knife an oblique draw knife stroke, as it ascends and descends, for the purpose set forth of cutting at the upward as well as the downward stroke, by attaching one end of the knife to a crank, and the middle to an adjustable vibrating rod, as set forth. Also the arrangement of the apparatus for turning the feeding rollers, for feeding or bringing forward the substance to be cut to the knife, as set forth, and the mode of regulating the cut of the straw, by the combination of the lever and screw rod."

6. For an *Improvement in Weaving Looms;* D. P. J. Murphy and D. Farrier, Aberfoil, Macon county, Alabama, December 4.

The patentees say,—"The nature of our invention consists in drawing back the lathe of the loom by means of tappets on the driving or cam shaft, and throwing it forward by means of a spring."

Claim.—"What we claim as new, is bringing forward the lathe by means of a spring, in combination with the method of drawing back the lathe, as set forth, constructed and arranged as set forth."

7. For an *Improvement in the Method of Effecting Combustion in the Furnaces and Flues of Steam Boilers;* C. E. Detmold, City of New York, December 4.

Claim.—"I claim the arrangement set forth for applying De Faber's invention, by combining furnaces for steam boilers and other purposes, with an hot air chamber or chambers, placed directly behind the grate, in or on the bridge wall, for the purposes of heating and introducing compressed air; and which hot air chamber is pierced on the side opposite to where the fire is, or in the direction of the flues, with numerous small apertures, through which continuous jets of heated and compressed air are forced, amidst the carbonic oxide gas generated in the chamber of combustion in the flues or hearth of the boilers, thereby causing its complete and rapid combustion."

8. For an *Improvement in the Condenser of Steam Engines;* Henry K. Stephens, Cincinnati, Hamilton county, Ohio, December 4.

Claim.—"What I claim as my invention, is the tubular condenser in which the steam is admitted to circulate around the tubes, whilst the water circulates through them, in combination with the cistern of water surrounding the whole, as set forth."

9. For an *Improvement in Garlic Machines;* Samuel Farhney, Broomsboro, Washington county, Indiana, December 5.

Claim.—"What I claim as my invention, is the combination of the disks, toothed or serrated circular plates, spring bars, and combs, for separating the garlic from the wheat, with which it is found intermixed, as set forth."

10. For an *Improvement in Breaking and Screening Coal;* Hopkins Thomas, Beaver Meadow, Carbon county, Pennsylvania, December 5.

The patentee says,—"The nature of my invention consists in using one or more iron rollers, of any given dimensions, and weights sufficient to crush the coal, in combination with a grated platform, said roller or rollers being connected by means of an iron yoke and rod to steam engines, or any other suitable power, which will give it, or them, a reciprocating motion over an iron grate platform, through which the coal is forced by the weight of the roller of rollers. Also, in combining the aforesaid breaking machine with an elevator or carrier, to convey the coal to the breaking machine, and the combination of the breaking machine with a revolving screen and shutes, or conductors, to convey the coal to any mode of transportation."

Claim.—"What I claim as my invention, is the combination of the vibrating rollers with the iron bars or rails, or perforated bed, through which the coals are forced by the rollers, for the purpose of breaking anthracite or bituminous coal, also the combination of the elevator or carrier with the breaking machine, constructed as set forth, by which means the coal can be regularly delivered into the machine; and the combination of the breaking machine, constructed as set forth, with the revolving screen and shutes, by means of which the coal is screened from dust, &c."

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11. For an *Improvement in Horse Rakes;* James Maltby, North Branford, New Haven county, Connecticut, December 5.

Claim.—"What I claim as my invention, is the mode of constructing a horse rake, that is to say, by combining a number of rakes with the leading bar, in the manner set forth, the handles of said rakes passing through and turning freely in the leading bar, for the purpose aforesaid; I also claim in combination the brake, constructed and operating as set forth."

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12. For an *Improvement in Sun Dials;* James P. Gardner, Columbia, Maury county, Tennessee, December 5.

Claim.—"I claim the mode of constructing said dials, that is to say, using therefor a hemispherical cup, having the lines laid off upon its inner surface, in the manner set forth, and the gnomon in the centre of the cup, arising from the bottom, all as set forth."

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13. For an *Improvement in Rocking Chairs;* Charles A. Ballard, Boston, Suffolk county, Massachusetts, December 5.

The patentee says,—"This invention consists of an elongated or other proper shaped cushion, suspended at its ends to the tops of two standards, by two rods or pieces of metal, and so that it will swing back and forth, or have a pendulous motion upon pins, or other contrivances of like character, or instead thereof, the said cushion may have journals attached to its ends, which may rest and play in suitable bearings in the tops of the standards. The standards are mounted upon rockers of suitable length and dimensions, and in order to secure the standards in their respective positions, they may be connected together by one or more cross bars. The cushion should be arranged so that it can be readily raised or lowered, to adapt it to the height required by different individuals."

Claim.—"Having thus set forth the nature of my invention, I shall claim the same constructed substantially in the manner set forth."

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14. For an *Improvement in Ploughs;* Peter Eichar, Wooster, Wayne county, Ohio, December 5.

Claim.—"What I claim as my invention, is the combination of the additional connecting bar and plough and braces, with the single plough for connecting the latter into a combined plough, in the manner and for the purpose set forth. I also claim the combination of the adjustable beam with the double plough, in the manner set forth. I likewise claim the manner of locking the land side of the mould board by means of the hook, mortice, pivots, and brace, combined and arranged as set forth."

15. For an *Improvement in Corn and Cob Crushers;* James L. McKnight, Buchanan, Botetourt county, Virginia, December 15.

The patentee says,—"The nature of my invention consists in placing two cylinders in a frame, one above another, and run in opposite directions, and being furnished with a concave, but placed on opposite sides."

Claim.—"What I claim as my invention, is the manner in which I have combined the upper cylinder and its concave with the lower cylinder and its concave, the said parts being arranged and constructed substantially as set forth."

16. For an *Improvement in Tuyeres;* Zadock H. Mann, Lowell, Middlesex county, Massachusetts, December 15.

Claim.—"What I claim as my invention, is, 1st, the use of the scroll or spiral pipe which takes the air from the nozzle of the bellows, and carries it around, as set forth, giving the air a whirling motion as it leaves the mouth of the tuyere. 2nd, I claim as my invention the method of shutting up the exterior orifice, or mouth, by raising the shaft by a male and female screw, or by a damper, so that the damper shall completely close or shut up the mouth; and the combination of an adjustable interior blast, or mouth, with the exterior mouth or blast, constructed and operating as set forth."

17. For an *Improvement in Coating Water Pipes;* Jonathan Ball, City of New York, December 15.

Claim.—"What I claim as my invention, is the application of hydraulic cement or water cement, as a coating upon the interior surface of metallic water pipes, to prevent the corrosion and oxidation of the metals of which the pipes are composed. Also the means by which it is accomplished, as set forth."

18. For an *Improvement in Door Springs, for Closing Doors;* Charles Ellis, Boston, Suffolk county, Massachusetts, December 15.

Claim.—"What I claim as my invention, is making the door spring of two springs, (instead of one as heretofore,) in combination with the two rods, jointed together, as set forth, the said door spring being arranged within the door and door frame, and operating substantially as set forth."

19. For an *Improvement in Axles of Railway Cars;* Nathaniel Miller, Franklin, Norfolk county, Massachusetts, and Edward Bancroft, Providence, Rhode Island, December 15.

Claim.—"We claim the method of constructing the axles of a railway carriage, viz: by means of an outer metallic shell or tube, in combination with an inner cylindrical or other suitable shaped wooden core, fitted therein and acting therewith, substantially in the manner set forth."

20. For an *Improvement in Valves for Hydrants;* Horatio H. C. Kelsey, City of New York, December 15.

The patentee says,—"The nature of my invention consists in making a circular surface valve for letting on, and off, the water from hydrants, or any other apparatus, the surface valve being so constructed as to cut the water off with much more ease than the ordinary faucit or cock, thereby preventing, in a great measure, the reaction of the head of water back on the lead pipes, which invariably bursts them; also in providing said surface valve with a circular recess, forming a passage, for the purpose of letting the waste water off from the egress pipe, so as to prevent freezing in the winter."

Claim.—"What I claim as my invention, is the general arrangement of the surface valve, in combination with the circular recess, forming a passage for letting off the waste water.

21. For an *Improvement in Bee Hives;* Thos. D. Howell, Zanesville, Muskingum county, Ohio, December 15.

Claim.—"What I claim as my invention, is the combination of the vibrating traps with the lighted case, arranged and operated in the manner and for the purpose set forth. And I claim said combination, whether applied to the common bee hives, or to any description of bee hives, for the purpose of excluding the moth or other insects therefrom, or for any other purpose."

22. For an *Improvement in the Buff for Polishing Spoons and other articles;* Luther Boardman, East Haddam, Middlesex county, Connecticut, December 15.

Claim.—"What I claim as my invention, is the uniting of the pieces of leather composing the buff, by stitching them to each other, at a proper distance from their outer edges, without the employment of any kind of cement or unyielding substance; the same being effected in the manner and for the purpose set forth."

23. For an *Improvement in Valves for Reversing the Action of Steam Engines;* Henry A. Morrill, Boston, Suffolk county, Massachusetts, December 20.

Claim.—"What I claim as my invention, is the combination of the three way reversing cock, with the induction and eduction pipes of a steam valve apparatus, or the double branch pipes of a double vibrating cylinder, having passages as set forth, or otherwise suitably arranged."

24. For an *Improvement in Seed Planters;* Henry Todd, Oxford, Grafton county, New Hampshire, December 15.

Claim.—"I claim the combination with the endless belt and discharging passage of the bell upon which the seeds are thrown, in the manner and for the purpose set forth. I also claim the combination of the flat angular clearing and surface board, with the angular furrow plough and coverers, arranged upon its lower surface, the object of the said clearing board being to remove any impediment to the correct action of the furrow-opener and coverers, and to regulate the depth to which the seed are to be planted."

25. For an *Improvement in Shingle Machines;* J. C. Gillet, Bloomfield, Oakland county, Michigan, December 20.

The patentee says,—"The nature of my invention consists in the construction of a machine which will cut perfect shingles from solid timber."

Claim.—"What I claim as my invention, is the manner in which I have arranged and combined the hoppers or boxes to receive the stuff to be cut, the horizontal revolving table and the knives attached thereto, said knives being so arranged as that one shingle shall be cut by one knife, before the second knife begins to operate, the butt being cut by one knife towards the shaft, and by the other towards the outer periphery. The respective parts being arranged and combined substantially as set forth."

26. For an *Improvement in the Bench Vise;* Jeremiah Peck, Waterbury, New Haven county, Connecticut, December 20.

Claim.—"What I claim as my invention, is the sliding jaw, in combination with the jointed jaw, as set forth, the former being used to set the vise to any desired size, and the latter to gripe."

27. For an *Improvement in the Soles of Boots and Shoes;* William H. Elsegood, Philadelphia, Pennsylvania, December 20.

Claim.—"What I claim as my invention, is the introduction and use of a felted horse hair sole, in place of the scraps of leather now used, called "bottom filling," and a silk oil cloth sole in place of gum elastic. I use a whalebone shank piece in place of leather, but make *no claim* to originality; these articles worked together according to the rules laid down will form a *dry,* warm, and elastic boot or shoe."

28. For an *Improvement in Grain Rakes;* William Gates, Barre Centre, Orleans county, New York, December 20.

Claim.—"What I claim as my invention, is the manner in which I have combined and arranged the raves and runners, and the manner in which I have combined, with the raves and runners, the posts or standards and connecting pieces, so as to leave an open space in the middle of the rake, to admit of binding the straw, as set forth."

29. For an *Improvement in Bedstead Fastenings;* Joseph Guild, Cincinnati, Hamilton county, Ohio, December 20.

Claim.—"What I claim as my invention, is the cast iron cylinder, introduced into the bed post and fastened with the pin, in the manner set forth."

30. For an *Improvement in Fences;* Isaac Van Amburg, Watertown, Jefferson county, New York, December 20.

Claim.—"What I claim as my invention, is the mode of supporting a fence by detached posts, that do not raise the fence, having no necessary connexion with it, except to keep it in its vertical position, and is equally applicable to posts and rails, as posts and boards."

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31. For an *Improvement in Sewing Machines;* Geo. H. Corliss, Greenwich, Washington county, New York, December 27.

Claim.—"What I claim as my invention, is, 1st, the particular combination of mechanism, by means of which the rectilinear and lateral movements of the awls are produced, viz: the grooved plate and rectangular lever, in connexion with the arm applied to the awl handle, and groove in the standard, between the guide boxes of the awl handle, the said awls being inserted in the bent arms of their handles, and the whole being otherwise arranged substantially as set forth.

"2nd. The particular mechanism by means of which the peculiar movements of the handles are produced, and by which they are introduced and drawn through the aperture made by the awls, viz: the needle shafts; the same operating, being constructed and actuated substantially as set forth.

"3rd. The peculiar combination of levers which is employed in the needle shafts, viz: the finger levers, and transverse levers, the same being constructed and operating substantially as set forth.

"4th. The peculiar method of forming stitches after the ends of the threads have been passed through the aperture made by the awls, viz: by confining said ends in a fixed position, as by the pliers, and then drawing the threads out in a doubled form by means of the pulleys, which are made capable of yielding to a given force, in the manner set forth, and thus accommodate themselves to the varying lengths of the threads, being for this purpose attached to the tripping levers, and said tripping levers being connected with the springs, the whole being arranged and constructed as set forth, and applied upon endless chains, or operated substantially in the same manner by mechanism of similar character.

"5th. I further claim making the needle with recesses and depressions, and one point of the needle below the other, the same being for protecting the thread in direct proximity with the eye, as set forth.

"6th. I also claim the particular mechanism which prevents the entanglement of the threads during the progress of the sewing operation, viz: the vibrating levers, the same being actuated in one direction by a weight or spring, or both combined, whilst in a contrary direction they are actuated by means of the threads which are *passing into* the aperture, and also by their own impetus, the said levers being provided at their front ends with guides, springs, or elastic branches, which enable them to *fasten themselves* upon the threads which are *passing out* of the aperture, and also permit the threads to extricate themselves from the levers at the proper juncture, the whole being arranged and constructed as set forth."

32. For an *Improvement in the Blooming Forge used in the Manufacture of Wrought Iron;* Simeon Guilford, Lebanon, Lebanon county, Pennsylvania, December 27.

Claim.—"What I claim as my invention, is the mode of constructing and using what is set forth as the cupola fire in combination with a forge fire, commonly called a blooming forge, for converting iron ore, forge cinder, or other metal into wrought iron, substantially as set forth."

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33. For an *Improvement in Machines for Combing Wool;* F. A. Calvert, City of New York, December 27.

Claim.—"What I claim as new, is, 1st, the combining with the vertical wheel of a flexible comb belt, said belt passing round two drums, or rollers, and being thereby made capable of delivering the wool on to the teeth, in a direction corresponding with the plane in which they revolve. I likewise claim the use of such a flexible comb, that is to say, having teeth formed on plates of metal, and attached to the flexible belt, whether combined with the wheel or employed for a like purpose in any other combing machine. I also claim the carrying down of the long and other wool, which has not been taken off by the drawing rollers to be worked over again, this being effected by the backing rollers and the toothed belt, the latter reconveying it to the flexible belt to be worked over again.—Lastly, I claim the manner of arranging and using what I have denominated the independent intersecting toothed wheel, for the purpose set forth."

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34. For an *Improvement in Machinery for Manufacturing Horse Shoes;* William Gibson, Troy, Renssalaer county, New York, December 27.

Claim.—"What I claim as my invention, is, 1st, the combination and arrangement of the parts concerned in the cutting off, the griping and the creasing, and the punching, so that these operations shall be performed by the cutters, the dies, the creasers, and punchers, all operating as set forth.

"2nd. I claim the manner of combining and arranging the respective parts of the apparatus for bending the shoe, as set forth, said apparatus consisting of the stationary double rack, with the former on its under side, the sliding table, the two cog wheels with their benders, and the sliding bar by which the piece is held against the *former*, the whole apparatus being constructed and operated substantially as set forth."

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35. For an *Improvement in the Method of Propelling Boats;* James H. Street, Philadelphia, Pennsylvania, December 27.

Claim.—"What I claim as my invention, is the employment of a propelling plate made to slide back and forth in grooved arms, and through a slot or mortise, in the axle from which it receives its motion; the respective parts of the apparatus being combined, arranged, and operating, substantially as set forth."

36. For an *Improvement in Hay Presses;* Samuel Hewitt, Allensville, Switzerland county, Indiana, December 30.

Claim.—"What I claim as my invention, is filling the box with the substance to be pressed into bale, by means of a driver raised by machinery, and made to descend upon the substance in the box, successively by gravity as the follower descends, whether effected in the manner set forth, or in any other substantially the same."

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